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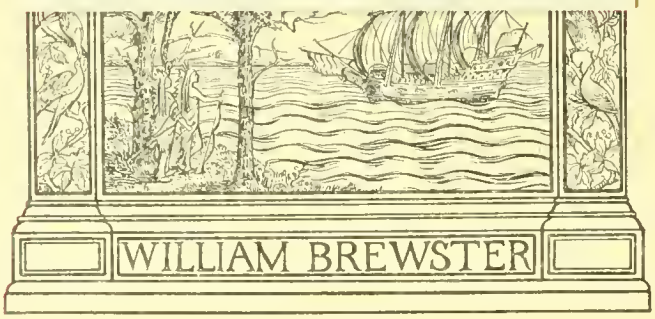

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THE MUSEUM.

A Monthly Magazine Devoted to Research in Natural Science.

VOL. V. ALBION, N. Y., NOVEMBER 15, 1898. No. 1

A Pleasure Trip on the Atlantic Coast.

(Continued from October Number.)

The next morning we take steamer for Edgartown, our destination for a few days. We find this a typical fishing village of some 1500 inhabitants, in the summer season possibly swelling to 2500. The houses are large square structures, mostly painted white and set close to the sidewalk. We notice an unusual number of door plates marked "Captain ———" and later on we have a number of pleasant chats with these old Sea Captains.

Many years ago, when the whaling industry was at its height, this port and Nantucket (the largest city on the island by this name some 25 miles distant) sent out no less than 150 whaling boats to the Arctic regions. To fit out so many boats, as there were seldom less than 40 men on a boat, took several thousand men from these two villages and required many thousand dollars worth of supplies. Large warehouses were built and many large blocks. Many of these have been burned and torn down but some still stand and are now used as wholesale fish markets, and a very few are used to store supplies needed in fishing.

Immediately after getting settled, we head for the nearest beach which is only a short distance away. We have purposely selected Edgartown as a resting place and collecting ground on account of its long sandy beaches, the salt water marshes nearby, the rocky coasts only a short distance in one direction, and the heavy surf and breakers only a few miles to the South. One of the first shells to attract one's notice along the pier walk to the Light house is Littorina Litorea. This little straggler not many years ago was introduced on our shores from England and like the English Sparrow has driven out many other kinds. The stones were literally covered with them from the size of a pin-head to an inch in diameter. We select a couple of quarts of them and consider that enough. With a little work one could easily gather bushels. While picking these up we find the home of hundreds of mussel shells. Walking along the beach at low tide we occasionally saw one adherring to a stone or bit of drift wood, but in among the large rocks of the stone pier was where we found the fine large ones and such beauties. Several species were noticed. Some require cleaning and some were as smooth as a Cowry shell. The family throw out a large number of fine threads near the hinge of the shell which stuck fast to the stones. Many bunches of shells would be composed of 2 big ones, 4 or 5 a grade smaller. then another grade and so on down to some ½ inch long, the largest being 3 inches or more. To all appearances they were successive generations. We soon had to return to the boarding place and "unload."

Taking a stroll down to the wharf we fall in with some of our three link fraternity and make the acquaintance of two jolly fellows from Cape Cod who are down here with their new thousand dollar "Cat Boat" fishing for Sword Fish. We are invited into the cabin so-called, shown the compass, barometer and other "fixings," including the chart of all waters in this vicinity for a hundred miles in every direction. While visiting with them, one says there comes Will F. and I guess he has a fish, meaning of course a Sword Fish. We watch the boat

come into the harbor and can soon see a monster fish lashed to the rail. This is too good to miss, so we go over to the particular landing place and see them unload and cut him up. It proved to be only an ordinary specimen and dressed 150 pounds, length 10 feet, the nose or sword being one-third the length of the fish. Coming back I at once arrange for a trip after Sword Fish, which will be described in a later paper.

The next day was a steady fog but we were bound to get out, even if everyone else staid around the house. Taking the row boat we pull along the shore for some two hours. These short rides along in the shallow water near the beach, where one can see everything on the bottom, were greatly enjoyed. Frequently it got so interesting we quit rowing entirely and I simply pushed the boat along with one oar, and stood in the front end with scoop net in hand. In places where the water was 3 feet deep, a sort of sea grass as thick as a mat would be $1\frac{1}{4}$ feet high. These patches of Sea Grass were of irregular shape and from a rod in diameter to several rods. The grass being of extremely dark color, the water on the surface would look "spotted," for all around these grassed plots would be the finest clear white sand imaginable with not a living thing growing in it. It was really amusing to watch the various species of crabs. As one passed over a patch of sea grass the spider crabs would be seen moving about. They are very inquisative chaps and not a bit afraid. Putting the scoop net down they would invariably walk in to see what it was like and the next minute seem much surprised when they were in the boat. Along in this grass we found species of very minute shells and any quantity of *Pecten irridians* but really large ones were scarce. Later on I met a collector on the island who had a salt pond in which he had planted a lot of beautiful Red Pectens. These he had fed and cared for and now had the largest and finest specimens I ever saw. They equaled any of the rarer and high priced species in beauty. His price was $1 a pair, which at first thought seemed ridiculous, when I had already seen thousands of bushels of Pecten shells, where the regular scallop fishermen had opened them. But after all it was not so high when one may hunt for days and not find a single really large and choice highly colored specimen.

Of the several species of crabs secured, one was beautifully spotted with blue. He was a shy chap and didn't relish being caught. If you put the net in front of him he would slide off side ways a mile a minute. Not over half were secured that were seen. Occasionally one would run a short distance and apparently stop an instant, tip up edgeways and dodge out of sight. He really dug a little hole in the twinkle of an eye and covered himself with sand. Lots of soft shell crabs were easily taken and a small brownish species. The little "fiddlers" would dodge into their tiny holes as one walked along a portion of the beach covered with low grass, and along the edges of the inland ponds of salt water.

It was during my first ride this morning in the fog I came to a large pond of several miles extent, called "Cape Pogue Pond." I turned into it and as the fog lifted for an hour or so had a pleasant time exploring its shores. On a little sandy point I approached close to 40 odd Common Tern. While poling along I saw a big black thing on the bottom moving about but it was too big to go in my net, which was only about a foot in diameter. I therefore reached down behind him and heading him for shore finally persuaded him to walk out on the beach. It was a horse shoe crab, so-called, the biggest I had ever seen. Keeping close watch I soon had six more big ones in the bottom of the boat, lying on their backs. They made things lively the balance of the

day. When I got them home they were put in a keg of formolin where they still repose. The vitality of this same horse shoe crab in my opinion throws a mud turtle or the cat with nine lives entirely in the shade. Having occasion to cut one up, I mad seven distinct pieces of it and still did not apparantly kill it for some time. The eight legs with a portion of the under parts would move about entirely free from the body.

Exploring the beach on foot we found many small species of shells alive, and this pond was about the only place we found the razor shell *Solen ensis*. They were burrowed in the sand and one would only see a little tip sticking out. In among the sea weeds piled upon the shores from recent storms one would find lots of small mollusks of various species, and occasionally skate eggs, strings of periwinkle eggs, &c. Returning back in the afternoon we found our time fully occupied preparing the crabs. fish, etc., also removing the animals from the shells, which can be easily done by first immersing them in boiling water. We had not been in the town 24 hours before any number of small boys had made our acquaintance and were all eager and willing to collect specimens. They knew where to find them and had their own names for them also. As a sample, one afternoon I had been out to the nearest buoy in the bay and cast anchor. Having caught a large mess of scop I thought I would let my line drag near bottom on my return, which I did I had not gone far before something was tugging at the line, and imagine my surprise when I pulled out a fish about a foot long with wings 6 or 7 inches long. As I pulled him over the side of the boat he jumped the hook, and as he struck bottom he raised his head a couple inches from the boat, and begun to grunt at me, quite like a pig. He kept this up for some time. On arriving ashore I put him in with the rest of the fish, and the first small boy I met, asked him the name, and he said, "Why, don't you know what that is ? It's a 'grunter.'" The next boy I asked said it was a "Methodist minister" and the third a "Flying Robin." I afterwards found that a grunter was the common name among the fishermen.

A glance at the harbor about sunset, and one would think something unusual was going on, as simply hundreds of sail boats, from the size of the regulation Cape Cod Cat Boat to a small row boat, were anchored as far as one could see. About nine o'clock in the morning these same boats will be seen going out up the channel, some after Bluefish, Sword-fish, Mackeral or Cod, but the greater share after "Quohogs," so called. A single man with a small sail boat, and willing to work at least 6 hours a day, can easily earn $4.00 every day he goes out. In ye olden times it was not uncommon to make $25.00 in a single day and many fortunes were made thereby. The gathering of "Quohog" clams by these hardy Portugese, as I found they were most all of this nationality, may be described as follows : Arriving on the "fishing grounds" the boat is anchored at each end in about 6 to 9 feet of water. The only implement used is a rake with a handle 25 feet or more long. The rake part is very heavy, weighing fully 30 pounds. It has teeth about 8 inches long and curved; also teeth at each end. When this is dragged on the bottom it combs out all clams of saleable size. When the rake is raised from the bottom, the dirt is rinsed out and the rake will be full of grass, clams, scallops, etc. Usually everything is thrown away but the particular clams wanted As fish dealers at the wharf will buy all clams offered at 65c to $1.00 per bushel, the small ones bringing the highest price, it furnishes employment for many hundred men. One would think they would play out after a while, but such does not seem to be the case, for really good clam fishing is found 5 miles

from town, where it has been persistently fished for 50 years or more.

(To be Continued.)

Sea Fowl Catching in the Faroes.

Seafowl-catching is greatly engaged in by the Faroe Islanders. Puffins, fulmars, guillemots, cormorants and shearwaters are all eaten at some stage of their existence, but puffins more than any of the others. During the season on Naalsoe Island as many as four hundred of these birds are often canght by a skilled fowler in a single day. At the end of June and beginning of July, when the young birds are hatched, but still remain unfledged in the burrows, the parents spend their morning out at sea, fishing for themselves and their offspring. About noon they begin to fly home, each with a row of small sprats or anchovies in its beak. At this time of day the fowler seats himself in a suitable spot behind a roughly built wall or a jutting rock on the cliff's edge. Resting before him he holds a pole some twelve feet long, on to the end of which a small triangular net is fixed. With this he catches the puffins as they fly over his head. Their flight is so feeble that they cannot start from the ground without launching themselves from the edge of a precipice ; nor can they rise from the sea unless they gain impetus by striking the water with their wings again and again. On a foggy day, with the wind blowing inshore, they are quite at the mercy of the man with the net. The puffins' breasts are salted and consumed in great numbers during winter, and their feathers form, next to stock-fish, the most important export of the islands. The other birds are either shot or taken from the nest, as their flight is much more powerful than that of the puffin. Quantities of guillemots' and razorbills' eggs are also collected in early summer, especially on the Great Diamond (Store Dimon), a desolate island occupied by a single family and shut off from all communication for the greater part of the year. The bird-nesters are let down over the edge of the cliffs on horse-hair ropes, which are twisted on a complicated piece of wooden machinery, needing three men to work it, and hardly doing the work of one. In Myggenaes during nesting-time similar ropes are stretched across chasms instead of bridges.

A Brief History of the Gathering of Fresh Water Pearls in the United States.

BY GEORGE F. KUNZ.

Distruction of the Mollusk.

As to what use or disposal, if any, is made of the shells after being examined for pearls and the animals destroyed, give a painful record of the utter waste of an enormous amount of material useful and beautiful for many purposes in the arts. The question is answered in seventy-four papers, with a melancholy uniformity. In only twelve of them is there any suggestion of utilization of the shells, and in only one of the use of the animals other than as fish bait, manure or food for hogs. Twenty-six of the answers say simply that there is no use made of them or that they are "wasted" or "thrown away ; " nine say that they are thrown into the water, and six add that the fish eat them and also the muskrats and tortoises ; seven speak of their being used for fish bait ; six for feeding hogs, and two for manure. Several merely say that they are left on the banks or shoals for rats, minks and crows to dispose of.

An Iowa pearler states that the shells are utilized for button making and that some people use the animal for making soup. The actual use of the shells for buttons is also referred to by two pearlers and their possible value for that purpose is noted in four other papers, though they are not so used as yet. One says that few are polished for ornamental purposes and another makes a similar statement,

adding that they are also used for paving garden walks and burned for lime. This latter use for lime is referred to also by three Tennessee papers as actual or possible, and one says that they might be "ground to cement," and one Wisconsin writer notes that some are ground up for the poultry.

As a Product for Food.

There would seem to be a strong presumption that the ancient people of the United States, must have used the Unios quite largly for food, as we know that the later Indian tribes did, as will be referred to later on. They naturally were thus led to the finding of pearls and accumulated large stores of them in the course of time. The ancient tribes of Brazil have left shell heaps along rivers tributary to the Amazon, composed of fresh-water shells of that region (Hyria and Castalia), and though no such stores of pearls have been found, yet the shells themselves have been much employed as ornaments among these people.

When it is remembered that the tribes of both North and South America made large use of the river mussels as an article of food, it seems extraordinary that only one instance of any attempt so to utilize them should appear in these accounts: although Canadian lumbermen catch them by allowing bushes to drag after their rafts in shallow streams, using the mollusk for food. They could perhaps often save life, if explorers or hunters knew of their existence, while the shells so capable of being wrought and polished into an immense variety of beautiful objects or ornamental art should command a remunerative price instead of being thrown away and wasted.

Utilization of Unio Shells for Buttons.

Several references from time to time have been made to the valuable possibilities of the abundant shells of the Unios, for various purposes of manufacture, and some few instances noted of their being polished as ornaments or cut into buttons. It is highly interesting to learn that this latter use has at last attracted attention and is developing into an important industry. A correspondent of the "St. Paul (Minn.) Dispatch," under date of November 13, 1897, gives an extended account of the shell button manufacture at Muscatine, Iowa, where already a number of factories are in operation. No dates are specified, but the statement is made that it was begun within a few years past by Mr. Bepples, a Farmer, who recognized the possibilities of such an industry, and established a factory at Muscatine, soon employing two hundred operatives, besides a number of outside people, gathering shells from the Mississippi River at that point. The enterprise proved profitable even under an unfavorable tariff, and several other factories were established, but since the recent protective legislation has gone into effect the business is increasing largely, eleven or twelve factories are now in operation, running 300 saws and employing 1,500 people. One of these was working on double time to fill orders for 20,000 gross of buttons for the "holiday trade" of 1897. The business is already an important element in the prosperity of the town, and as the supply of shells is enormous it is expected to increase in extent. Other works exist also in Iowa, at Davenport and Saluba and at Cedar Rapids on the Cedar River. There are also Eastern factories referred to that cut the shells into "blanks," i. e. unfinished discs, and send them to Muscatine to be polished and perforated.

The shells have been gathered by men and boys wading in the shallow water and working from boats in the deeper parts with rakes provided with a wire net or basket. Now, however, steam dredging is to be employed. One such boat has been built, and another is under construction. The dredge will take up a ton of shells in an hour—a process now slowly conducted in small furnaces. As the

gathering cannot be carried on in winter when the river is frozen, prices rise in autumn. Several species are capable of being used, of which two are particularly mentioned, these are "nigger head" shells, which have risen with the approach of winter from 35 cents a hundred to 70 cents, and "sand" shells have advanced correspondingly from $1 to $2 per hundred.

PRESENT ABUNDANCE OF THE FRESH-WATER MUSSELS.

Out of eighty-three papers which respond to this inquiry seven describe the shells as at present very abundant, thirty-six as plentiful, twenty-five as scarce, and three as absolutely exterminated, while twenty-eight papers refer to the fact of diminish and diminishing numbers within a few years past, some of them with great emphasis. The papers, Tennessee, Nos. 7, 32 and 33, estimate the present number as reduced to one-tenth of what they were ten years ago, and over the same general fact is stated of former abundance and present rarity, and attributed to the pearl hunting distruction of a few years past. Several papers say that the shells are now scarce in small streams and shallower parts of large ones, while still abundant in deeper water and where the currents are strong.

NATURAL ENEMIES.

The response to question No. 7 in eighty-four papers are varied and interesting, and in some respects quite contradictory. The chief natural enemy of the Unios appears to be the muskrat. Sixty-five papers refer to it, twenty-six reporting large destruction from this cause, thirty-eight in some degree and one denying it.

Hogs come next, and are referred to in forty-seven papers. Of these seven hold them responsible for large destruction, thirty-five for some, or a little, and five asserting that there is none. Of other animals raccoons are stated in thirteen papers to destroy some shells; mink in five, mud-turtles in three, crayfish in two, aquatic birds in two, and cattle by trampling, in three. All the animal depradators deal only or chiefly with the Unios that are either young, small-sized or soft-shelled, and hence not largely pearl-bearing. The only exception to this general rule is the statement in one paper that many pearls have been found where shells had been taken ashore by muskrats and left to open in the sun.

INJURIES DUE TO PHYSICAL CAUSES.

With regard to physical causes of injury the most serious no doubt is found in freshets. Of thirty-one papers that refer to these, seventeen report great destruction thereby, thirteen say "some" or "a little," and one denies that there is any. Some papers say that their injury is small, and that they only shift the beds and redistribute them, but a number describe the burying of beds by the washing down and caving in of the beds in flood time, or the stranding of great quantities of young shells to perish when the water subsides. Two papers that do not mention freshets should doubtless be included here, however, as they speak of destruction caused to the shells by "covering with mud" and by "change of bars." On the other hand, low water and droughts are reported as seriously harmful in five papers, and drift-ice in three. Two papers allude to disease as a cause of injury and three to boring parasites.

EXTERMINATION OF THE MOLLUSKS.

Question No. 28, as to exhaustion of the mussel beds, its causes and its rapidity, has called forth a very suggestive body of replies in fifty-seven papers. The remaining third makes no response or none that is at all definite. Nine papers report extermination of the shells, either actual or imminent, within a very few years past: twenty speak of rapid diminution in their numbers; sixteen of decrease as noticed and progress, eight are uncer-

tain, or report little or no change, six describe them as abudant, or "inexhaustible," and four refer to partial recovery or replenishment after reduction. In forty-five out of fifty-nine papers, therefore, or approximately three-fourths, the process of exhaustion is recorded at time already complete. Of these twenty-six state the cause as pearl hunting, mainly or wholly, and ten refer to other agencies —one or two each to low or high water, deposits of sand or mud, ice, boats, hogs and rats. Of seven answers from Wisconsin, where so many pearls of remarkable beauty were found in the early nineties, five report the shells as nearly or entirely exhausted, and two refer to rapid reduction due to careless and ignorant persons taking the small and young shells as well as those more likely to contain pearls. A Tennessee paper alludes to the same reckless habit, and estimates the shells remaining as about 4 per cent. only of the number in former years. The destruction of young shells is also mentioned in Indiana. In New York it is stated that a good pearl fisher can "clean out" a bed of 500 shells in a day. The Ohio paper speaks of hundreds being opened daily. In Iowa one states that the river will be exhausted in two years. Of those that speak of little change several remark that much is not known or done in regard to pearls in their localities. Of the four that allude to recovery, Tennessee says that the beds are cleared out about every two years and renewed in four. One says that they exhaust yearly and rebed in one or two years; another states that the shells return every year, but in less numbers, and Texas reports that many beds that have been worked out are recovering through the growth of the young shells that were left unmolested.

To be continued.

Note the ad. of "Wholesale Bargains" elsewhere in this number.

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Notes on American Shipworms.

"During the summer of 1893, while engaged in observations on the oyster at Beaufort, N. C., for the United States Fish Commissioner," says Chas. P. Sigerfoos, in the Fishing Gazette, "I became interested in the various shipworms which are found so abundantly in the waters of North Carolina. During the summer we made some observations on their natural history, and returned for periods during the two succeeding seasons to continue them. The results have been incorporated in a paper on 'The Natural History, Organization and Late Development of the Teredinidæ,' which is almost ready for publication.

"The shipworms were favorite objects of study during the eighteenth century, on account of their great damage to the dykes of Holland in 1733 and subsequent years. The contemporaneous observers seem to have been unaware of the observations of Pliny and others in ancient times, and

supposed the shipworms were natives of India, whence they had been brought by shipping in modern times. During these times they were considered true worms, and it was not till the time of Cuvier that their molluscan characters were recognized.

"Even if the shipworms were not recognized to be bivalve mollusks from their adult organization, it would be easy to determine this fact from a study of the development.

"The shipworm starts in its development as an egg which none but a specialist could distinguish from the eggs of most bivalves. In American forms that seem most abundant; at least in our Southern waters, the eggs are cast freely into the water and soon fertilized by the male element. As soon as fertilized tne eggs begin to develop, and in our warm Southern climate become little free-swimming creatures in from three to four hours. It is true that these little creatures have as yet none of the distinctive features of the shipworms, or even of bivalve mollusks. But within a day the bivalve shell is acquired. For a few days one can rear the larvæ in an aquaria, but after a time tne conditions become unfavorable and they disappear. For perhaps three weeks more, in a state of nature, they lead a free-swimming life and are gradually transformed into a little free-swimming bivalve almost exactly like the little clam or oyster. But how or where in nature this transitional period is passed has not been observed.

"The next stage which the writer found was the little bivales, about a hundredth of an inch in diameter, crawling over the surface of the wood in quest of places for their future homes. Once they have found appropriate places they begin to change. One by one the bivalve characters are lost, and the little bivalves are transformed into the very long, worm-like creatures which are found in wooden structures in salt water the world over.

"But along with the transformation the bivalve shell is preserved, though it is much modified as compared with other bivalve shells, and covers only a small part of the head end of the body. With it the shipworm excavates the burrow in the wood in which it lives, and seems able to penetrate the hardest or softest kinds of wood with equal facility. As the wood is grated away by the shell the small particles are taken into the digestive canal and the debris is extruded through the anus; but whether in serves for food in any way is a question in dispute. During its life in the wood at least the larger portion of its nutrition is taken in through the tube that hangs at rest in the water, and consists of small animal especially vegetable organisms.

"In thinking of shipworms, then, it should be remembered that the wood in which they form their burrows is primarily for their own protection, their long, naked, delicate bodies being perfectly defenceless.

"At Beaufort all kinds of unprotected wood becomes literally riddled in a very short time, There are two kinds of worms found there in great and about equal abundance.

"These are the Teredo nonvegica and Xylotra fimbriata, whose mode of spawning has been already described. However, a very small proportion of specimens were of Teredo navalis, one of the common European forms. In this species the eggs are retained in the gills of the mother during a considerable period of their development, perhaps almost till time for them to set into the wood. It is apparently this last species which the writer has found most abundantly in Long Island Sound, though a considerable portion of *Zylotra fimbriata* were also found.

"The breeding season in North Carolina, so far as determined, lasts at least till the middle of August, and perhaps throughout the summer. That the latter is true is indicated by two sets of facts. In the first place, in-

dividuals are found with ripe sexual products during the early part of August, and the young derived from eggs laid at this time must continue to set till September or later. In the second place, the young were setting in the wood abundantly till the middle of August, a fact which indicates that the same continues to some degree for some time longer. Of course, from an economic standpoint the period during which the wood is attacked is one of the most vital points to discover.

"The number of young produced is amazing, estimated in one case at from a single very large female one hundred million, and while the greater part are lost before the setting stage is reached, yet the number that set is very great, and one of the most discouraging features in dealing with shipworms in a practical way. If the spat were of fairly appreciable size and set in but moderate numbers, it might be feasible, by the careful removal of all old piles and other old timbers, to sufficiently reduce the number to a minimum. But when, under favorable conditions, over a hundred to the square inch set where there is not room for more than one or two to reach maturity, it is easily seen what an excess is always present, and how futile it is to try to combat the larvæ before they enter the wood.

"The practical way, of course, is to prevent their entrance into the wood by protecting the wood with copper paint and sheeting. With small piles and timbers it would seem to be worth while to try various means of keeping the bark on the wood, which, so far as the writer knows, has not been done; for it is well known that as long as the bark is on timbers they are not attacked by shipworms.

"Once the shipworm has set into the wood it grows with amazing rapidity in our Southern waters. In twelve days it has grown to be an eighth of an inch long; in twenty days about half an inch; and in thirty-six days four inches, when it is thousands of times as large in volume as when it sets. It has become sexually mature and is ready to produce a new generation. How long shipworms may live has never been observed, though it is probably several years, and that during this time they keep growing, if there be room in the wood for growth; though when crowded the individuals become dwarfed. The writer has found specimens of great size of T. Norvegica, some three to four feet long, and it is easily seen how destructive may be a few of these individual which may become almost an inch in diamater. The age of such specimens I have not been able to determine, but it is estimated to be less than two years.

"In the colder waters of Long Island the writer has found specimens of both T. navalis (?) and Xylotrya fimbriata, the former more abundant. They seem to set more abundantly after the 1st of July, though observations for one season cannot be conclusive. The rate of growth is much slower and it would seem to take twice as long to attain the same size as in the warmer Southern waters.

"The writer in his studies of the shipworms has paid most attention to features purely scientific in their interest.

"Observations, to be of any different economic value, must cover a variety of localities under different conditions, and must extend through a period of years—observations which the writer has not had sufficient opportunity to make and which for our American forms have unfortunately never been made."

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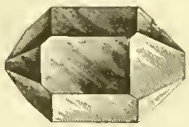

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THE MUSEUM.

A Monthly Magazine Devoted to Research in Natural Science.

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Some Hints on the Preparation and Mounting of Microscopic Objects.

BY W. H. WALMSLEY.

So much has been written and published on this well worn subject that it would seem almost superfluous, if not presumptuous in me to attempt to add thereto. But recollections of the many failures, in my early attempts in years long since gone by, of the wastage of time and materials incurred, and the unsatisfactory knowledge gleaned from books, impel me to jot down for the benefit of others, the results of actual experience in this work.

Whilst by no means asserting that the processes to be described are *the best*, I would say that I have found them to be uniformly satisfactory, yielding always the desired results, and that all have stood the tests of actual use and experience. I shall give nothing that I do not use in my daily work; and shall not state what "my friend Smith" *says* "is his process," or that "I am told Mr. Jones does this or that." Smith's and Jones' processes *may* be vastly superior to those I shall give, but not having tested, I shall not speak of them, my intention being to give simply and succinctly as possible, my methods of prep ring and mounting ordinary objects of interest; which may prove of use to many a beginner in this fascinating pursuit.

Nearly all microscopic preparations are mounted in one of three ways; in balsam or other resinous media; in air in the dry way and in aqueous or other fluids. Of these methods I shall proceed to speak first of balsam mounts, the *essential* materials for which work are as follows:

A bottle or tube of pure filtered Canada balsam; a bottle each of 95 degrees alcohol, pure benzole, oil of cloves, and liquor potassæ (the latter with glass stopper); a pair of fine *curved* forceps, which should be nickel-plated; another of fine dissecting scissors, and a small dissecting knife; two needles in handles; a few small red sable brushes; one large camel's hair brush; a glass pomatum jar; nest of porcelain dishes; and a few watch glasses; a wide-mouth 8 oz. vial with glass stopper; small glass rod; some pieces of very fine brass wire; glass slips and covers, with suitable labels, and a small bell-glass.

To these may be added the following *non-essential*, but very convenient articles: A capped bottle with glass rod, for containing the balsam; a small brass table with spirit lamp; a turn table; porcelain mounting plate; magnifying glass on stand, with elongated arm, white zinc cement, shellac ditto, and colored fluid for ornamental ringing; a bottle of absolute alcohol; and a writing diamond. The *luxuries* may be mentioned under the head of a well made self-centering turn table; a hot water drying oven; fine spring scissors; an assortment of dissecting needles, books, scissors and knives; and a pair of binocular magnifiers, mounted upon a firm stand, with focussing adjustment. But all the processes of mounting to be here named may be performed with the tools and materials mentioned under the head of *essentials*.

Having thus started in business with our capital of tools and materials, let us proceed to put them to the test of actual use. And I can provide no better subject for a beginning than a common blow fly, or an ordinary house fly, either of which will afford material

for several different processes of balsam mounting. A female should be selected, as the ovipositor, which usually contains some eggs, affords a most interesting and beautiful object.

Vivisection not being favored by the writer—first kill your fly in the most humane manner possible (chloroform recommended); —then proceed to clip the wings off close to the body, which, not needing any preparatinn, may at once be placed in alcohol, in one of the covered porcelain saucers. The legs, being cut off, should be placed in liquor potassæ, which should be contained in the glsss pomatum jar with a cover. By gently pressing the abdomen, the ovipositor will protrude to its full length, and should then be cut off close to the body, and also placed in the liquor potassæ. The tongue should be pressed out in like manner, and when found (under the magnifying glass) to protrude to the full extent, with all its parts, should in like manner be cut off and follow the legs and the oviposiier. Then the abdomen may be cut open with the scissors, the viscera washed out with the small sable brushes and water, and the skin or epidermis containing the spericles be placed in the liquor potassæ. The trachea and eyes, requiring different treatmen to that we are now pursuing, will not be followed further at present.

The length of time necessary for the various parts to remain in the liquor potassæ, varies materially. Thus an hour or at the most, two, will suffice foı the tongue and ovipositor, whereas the legs and epidermis will require an immersion of not less than one or two days. Great care should be taken to remove them before too much color is abstracted, as the beauty of a preparation is quite lost if it be pale and colorless. A good rule is to remove these parts from the liquor as soon as they assume a lightish brown appearance; placing them in water and carefully washing and brushing them with the sable brushes. One of the nest saucers will be found a most convenient vessel for doing this in. They should then be transferred to a glass slip, taking care (with the tongue) so to spread it out with the needles as to show the lobes and false trachae, and (with the feet), to show the hairy pads. When properly spread out, place another glass slip over them so that they are preesed flat between the two and wrap tightly with a piece of fine brass wi.e, which for this purpose should be cut in lengths of 10 to 12 inches. The wire is recommended rather than thread of any kind, because there are no fibres to become entangled with the specimen, and thus mar its beauty; and it may be used many times over. The slips thus wrapped should then be dropped into a vessel of water, and left for some hours. On being taken from the water and the wire removed, the slips should again be placed in a saucer or small plate of water, and carefully separated to avoid marring or injuring the specimens. These should then be gently, but thoroughly washed and brushed, to remove every remnant of the liquor potassæ or dirt that may have adhered to them, and dropped for a few moments into alcohol; one of the nest saucers again forming a convenient vessel for this purpose. The slips of glass having meanwhile been wiped clean and dry, the objects are again to be transferred to one of them, covered with the other, wrapped with the wire and dropped into alcohol, whieh for this purpose should be contained in the wide mouthed bottle with glass stopper. And here they may safely rest until we ara ready for the final operation of mounting; be it the next day, or year, matters not, as the alcohol will not alter or bleach them.

The final work to be done upon our specimens, preparatory to mounting, is transferring from the alcohol to oil of cloves, which is substancial repetition of the previous transfer from water to alcohol. The slips of glass

taken from the bottle, and the wire removed, are to be placed in a saucer containing alcohol, and gently separated, to avoid injury to the specimens, which are now to receive their final brushing. If we have provided ourselves with absolute alcohol, a short immersion in the same, in a watch glass is advantageous, but not absolutely necessary. And now having poured a small quantity of pure oil of cloves into one of the porcelain nest saucers, we carefully transfer the tongue, feet, etc., to the same; not forgetting the wings (which all this time have lain quietly in the alcohol, as originally placed, not having needed any of the complicated manipulations), immediately replacing the cover to exclude dust.

It will be observed that I rigorously excluded turpentine in all forms, from my work. I have ever found it a most unsatisfactory medium, foul smelling, sticky, and rendering all tissues immersed in it stiff and brittle. Oil of cloves, on the contrary, is in all respects a most admirable medium, rendering all tissues and substances fully as clear as turpentine; is agreeable to the sense of smell, does not stiffen anything immersed in it, and is perfectly miscible with balsam or damar.

After this digression, and whilst our specimens are clearing up in the oil, let us see to our glass slips and covers, and to the balsam in which the former are to be mounted. Very many processes for cleaning the slips and covers have been given to the world by various writers, and probably they are all good. I give only my own, which I have used for many years, with entire satisfaction, and therefore can confidently recommend it. The slips (which should be smooth edged), are placed in a basin with *hot* water and good soap, and wiped dry with a soft towel, after being thoroughly washed and rinsed. They are then placed in a drawer, and are ready for use at future time, merely requiring to be brushed off with the large camel's hair pencil when used. The thin covers (which should *always* be circles, and not squares, as making neater and more readily finished mounts), are dropped one by one in a glass tumbler, containing sulphuric acid, and allowed to remain there for some hours. The acid is then poured off, and water *carefully* added, which in its turn is decanted and replaced with fresh water, the whole contents of the glass being freely agitated until every trace of the acid is removed. One of the glass pomatum jars is now to be partially filled with alcohol, and the thin covers placed therein to remain until wanted for use, when they can be removed with the forceps, and a slight wiping with an old, soft linen handkerchief will leave them brilliantly clean.

To be continued.

The Finches of Southern California

Carpodacus purpureus californicus. (Baird)

Carpodacus cassini. (Baird)

Corpodacus mexicanus frontalis. (Say)

I have received so many inquiries from my ornithological correspondents regarding these three species that I have deemed it expedient to answer all queries at once and through that medium which I believe will reach the greater part of those collectors—THE MUSEUM.

My acquaintance with the genus *carpodacus* began some nine years ago and was with the most numerous species, the common House Finch or Linnet. During the years that have passed since that time I have been especially interested in this family and have endeavored in every way to familiarize myself with their habits and life-histories.

If we take them in the order named by the A. O. U. check-list we find that the least common species, or rather sub-species, is placed first

While the California Purple Finch does breed in at least one of the seven southern counties of California, nevertheless it is not at all common below the thirty-sixth parallel. From that locality northward to the Columbia River and perhaps to Vancouver's Island is the favorite breeding range. Here it finds suitable nesting sites in the coniferous forests which clothe the higher hills and mountains and seems to prefer regions further from the "busy haunts of men" than do either of the other two.

This is the most beautiful of our *Carpodaci*. The whole upper part of the body is crimson, perhaps a little brighter on the head shading almost to purple across the lower back and greater wing coverts. Below, this crimson extends over the greater part of the breast, sometimes even to the tibiæ. The belly, as is common with the Fringillidæ, varies from gray to pure white. The female is usually slightly smaller and is clothed in a neat brown suit with "a very light superciliary stripe." Regarding their food and general history I still have much to learn; but I have seen them feeding on the seeds of the so-called "Wild Sunflower," in company with Cassin's and the House Finch. Their song is rather more interesting than pleasing: although during the breeding season I have heard quite a considerable "rondeau" rendered from the top of some tall willow or cypress. One pair in particular stayed throughout the whole winter of 1897-8 in two large cypress trees in our yard. I have often spent a half-hour vainly searching for some hidden warbler whose song I could plainly hear and at length come upon little *purpureus*, the source of all the music.

I took but one set of this species this season. For some unaccountable reason they were much scarcer this year than last while Cassin's bird was correspondingly more plenty. The nest held four slightly incubated eggs, pale bluish-green in color, spotted with brown and black. The set was not typical although the date—May 21—was just at the height of their breeding season. The nest, placed in a Eucalyptus tree twenty feet up, was woven from weed stems, small twigs, grasses; etc. I do not have the nest at hand but think it was fairly typical. Usually the eggs are deep greenish-blue very sparingly spotted with brown, lavender and black. Most authors say that lines are characteristic of the typical eggs of the House Finch, while spots and blotches distinguish the other two species of this genus. This has not been my experience; I have several sets of Cassin's Finch which do not differ at all from a large series of *C. mexicanus frontalis*. The difference between the eggs of *C. cassini* and *C. californicus* seems to be chiefly in shading and ground-color. While the former is the larger bird, still the eggs are nearly the same size. A large series of *C. purpureus californicus* gives an average measurement of .57x.74 inches, while a series of Cassin's averages .58x.79. I think the egg of the California Purple Finch is the more round in outline, and Cassin's the more pointed oval, somewhat similar to the egg of the House Finch.

My experience and notes on the second species have been confined to the past two years in this (Orange) county. It is a much paler species than the first and consequently less noticeable. The upper parts are usually grayish-brown, with some irregular black-brown markings. The crimson of the head and rump sometimes, though rarely extends down the breast and a slight reddish tinge is occasionally found on the wing coverts. This bird is seldom over one-half inch larger all around than the preceeding and usually not over one-fourth.

I have found them nesting in nearly every variety of tree indigenous to Southern California, but they seem to prefer a tall willow tree, especially one in which the limbs are large and so situated that the nest may be plac-

ed close against the main trunk. Live Oaks, Eucalypti and Sycamores are also favorite trees while one now and then finds a nest placed in the fork of some tall Cactus or California Holly bush. The nest is well made, the best of any of the genus. It is usually woven from the fine inner bark of some dead willow tree and lined with "down" from the same tree.

I took several sets of this Finch during the present season. Of these fully seventy-five per cent. were of four eggs and the remainder of three and five. According to my notebook the first set consisting of four fresh eggs was taken March 27th and the last, one of three eggs, incubation advanced, June 10th. The greater part of the nests found in Aprll however were incomplete, and those found in June contained young almost ready to fly. The eggs are rather pale greenish-blue in color and average .58x.79 inches.

Their food is of course much the same as that of the other Fringillidæ; weed seeds, small grain, and such fruit as they may be able to obtain from the numerous foot-hill orchards.

Whether they are strictly vegetarian or not I cannot say positively but think they are. The song of this bird is very much the same as that of *C. californicus* only much longer, but I think they are by nature a more quiet bird than either of the other two. They do not seem to seek such hidden nesting places as does the California Finch, and so are less often seen in the higher mountains during the breeding season than in the warm interior valleys and canyons.

Of the one remaining species little good can be said. It is the greatest pest except perhaps the Gopher with which the Southern California orchardist has to contend. Many and various are the methods devised for ridding orchards and gardens of these "Linnets." Few, it must be said, result in anything more than failure: but one, invented I believe by Mr. Mills of the Pomona Experiment Station, has so far proved very successful. He sinks pans of poisoned water flush with the surface of the ground and throws enough dirt into these to darken the reflection of the tin so that they resemble muddy pools put there for the especial benefit of the birds. They drink readily from these and thus many are killed every day.

The birds are so well known as to hardly bear re-descripion. Their breeding range, dates and number of eggs are almost the same as those of *C. cassini*; while their food is anything eatable but preferably fruit and the green leaf-buds of the apricot and peach. They place their nests anywhere; trees, vines, outbuildings, old cans, and in fact any nook or cranny of sufficient size is made use of by these familiar little birds. The eggs are seldom more than five and in nine cases out of ten are of that number; even the second laying is seldom less than four. If robbed once and the nest left undisturbed they will lay a second and sometimes a third clutch.

The opinions put forward above are of course only the result of individual observation without any comparison with any other collector's notes, and I should be very glad to hear from other Western collectors on any of these three, for it is only by such interchange of observations that we learn thoroughly our lesson from Nature's ever-open story book.

HARRA H. DUNN,
Fulerton, Orange Co., Cal.

Nebraska Academy of Sciences.

The ninth annual meeting of the Nebraska Academy of Sciences was held at Lincoln, November 25th and 26th in Science Hall of the University of Nebraska.

After a brief business session in the forenoon of the 25th the program was commenced in the afternoon by the address of President Henry A. Ward upon "The Fresh Water Biological

Stations of the World." This very interesting paper enumerated all the important labratories and other stations and described the work of the famous biologists in Europe, Asia, America and elsewhere and was greatly enjoyed by the Academy.

Dr. Robert H. Wolcott read a paper entitled "Methods of Collecting and Preserving Water Mites" and exhibited prepared specimens ready for study.

In a paper entitled "The Southern Maidenhair Fern in the Black Hills." Dr. Charles E. Bessey gave an interesting account of finding this southern fern near Cascade, South Dakota, where it grows along a stream which is fed by warm springs.

A very interesting paper upon "The Second Year's Flora of a Dried-up Millpond" a continuation of a paper presented at the last annual meeting was read by Mr. C. J. Elmore. Mr. Elmore intends to continue his work upon this same subject during the coming year.

Numerous valuable and instructive papers were presented to the Academy among which were: "One to One Correspondence," by Dr. Ellery W. Davis; "A Determination of the Latitude of the Observatory"(of the Uni of Nebraska at Lincoln), with charts and maps, by Professor Goodwin D. Swezey; "Obituary of Professor Wells H. Skinner" by Mr. A. T. Bell; "The Growth of Children" by Professor William W. Hastings; "*Thorea*, a Recently Discovered Seaweed of the Lincoln, Neb., Flora." by Messrs. A. A. Hunter and E. G. Sedgewick; "On the Poisonousness of Pure Water" by Dr. A. S. VonMansfelde; "What is Phyto-geography?" by Dr. Roscoe Pound; "Some New Grasshoppers and Other Related Insects from Argentina" by Professor Lawrence Bruner; "How Some Pistils Close Up" by Mr. Ernest A Bessey; "A New Bird Tapeworm" by Mr. George E. Condra, who mentioned that in nineteen Sandpipers examined their stomachs contained from one (1) to fifty-fix (56) taenia each. The species suffering most from these parasites was found to be Tringa fuscisollis; "Observations on the Leonid Meteors of 1898" by Professor G. D. Swezey (with charts showing the course of a large number of the meteors as observed from three different stations at one time); "On the Occurrence of a Fresh-wafer Nemertine in Nebraska" by Mr. A. B. Lewis; "Notes on the Falling of Leaves of a Cottonwood Tree" by Mr. C. J. Elmore; "The Hydrachmidæ of Nebraska," a systematic review of the water-mites in this state and also describing a new genns and sixteen new species by Dr. R. H. Wolcott; "Preliminary Remarks upon Some New White River Geodes" with several specimens for examination, by Miss Carrie A. Barbour; "Botanical Notes for the Year of 1898" by Dr. C. E. Bessey.

On the evening of November 25th Professor Lawrence Bruner delivered a very interesting lecture upon the "Flora and Fauna of Argentina," which was illustrated by stereopticon views of scenery, plants and animals of the South American Republic. Professor Bruner spent nearly two years in Argentina in 1897-98, studying the locusts and grasshoppers and his discourse upon the subject was as viewed from the eyes of a naturalist and observer.

At the closing business session the following officers were elected: Professor Goodwin D. Swezey, President; Dr. Harold Gifford; Vice-president; Professor Lawrence Bruner, Secretary-Custodian. Mr. George A. Loveland, Treasurer.

Alexander Agassiz, J. M. Coulter, Samuel H. Scudder, Joseph LeConte, Simon Newcomb, Otto Kuntze and Victor Henson were elected honorary members of the Academy.

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A Monthly Magazine devoted to Ornithology, Oology, Mollusca, Echinodermata, Mineralogy and Allied Sciences.

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Albion, N. Y.

Correspondence and items of interest on above topics, as well as notes on the various Museums of the World—views from same, discoveries relative to the handling and keeping of Natural History material, descriptive habits of various species, are solicited from all.

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NOTES.

The Shell Collection of Dr. James Lewis of Mohawk, N. Y.

Having since the issue of the last Museum bought the large collection of shells made by Dr. James Lewis, a few remarks as to the life and work of this well known conchologist may be of interest to our readers. From the *American Naturalist* of June, 1881 we quote as follows:

"Dr. James Lewis, the well-known conchologist, died of apoplexy, at his home at Mohawk, N. Y., February 23, 1881. He was born at Schuyler's Lake, Otsego Co., New York, in July, 1822. He was, therefore, nearly 59 years of age at the time of his death.

Like many another who has become distinguished in natural science, his earlier education was confined chiefly to the common school. At the age of twenty-four he began to read medicine, and prosecuted his studies for some three years, when he became interested in dentistry, and abandoned the broad field of general medicine, devoted himself to this special branch of medical science. For this he was eminently fitted by his great mechanical skill, and to the implements employed in his art he contributed many permanently valuable improvements. It is as a naturalist that we have to consider Dr. Lewis. He became interested in nature in his childhood, and that interest deepened with years into admiration, and admiration into love, which led him to intelligent, untiring pursuit. It was while he resided in Boston, Massachusetts, from 1849 to 1851 that he became interested in his favorite science and formed the nucleus of what was to become one of the most valuable private collections of American land and fresh-water shells extant. From that time until a year or two previous to his death, he was a most devote student and untiring enthusiastic collector. He is widely known to the authorities in the science he cultivated by a very extensive correspondence, of which art Dr. Lewis was certainly a master. Within the scope of his acquaintance are embraced all the living names familiar to the young naturalists, and many others who have passed away. His published works, when the magnitude of his labors and the opportunities they have presented are considered, have not been many, but all published possess permanent value. They date from 1854, and number some eleven titles. The first consists of notes on "*Mas Marg marginata*," published in 1854. In 1856 he published three papers, two in the Proc. Bos. Soc. Nat. Hist. and one in the Proc. Acad. Nat. Sci., all relating to the Mollusca of the State of New York, and two of them are local lists, with notes. In 1857 he publishad a single paper "On Erosion of Uniones," in Proc. Bos. Soc. Nat. Hist. In 1860, two papers, one on "Colors of Unionidæ," and the other a local list, both of which appeared in the Proc. Acad. Nat. Sci.

of Philadelphia. He published nothing further until 1868, when appeared a paper in the *Am. Jour. of Conchology*," "On the Mollusks of the Mohawk valley." In 1869, in the same journal, he published a valuable paper "On the Shells of the Coosa river," Alabama. The bibliography and indices of Dr. Lea's "Synopsis of the Unionidæ" next engaged his attention, and they are, in great part, largely arranged by him. His last published work of value appears in the Geological Report of Alabama for 1875 (?), and contains the almost complete geographical distribution, by streams, of the shells of that state. Some very suggestive remarks are likewise appended as notes to the work which he has there performed. The major part of his life's work remains behind him in the form of MSS., many of which had they been published, would add largely to our knowledge of fresh-water forms. The great work of Dr. Lewis was as a systematist. In this field he was an acknowledged master, and here his services were frequently required by individuals and freely given. He arranged and classified many public collections, among which were the American fresh-water shells in the Smithsonian Institution, the last critical revision of which was made by him; the collection of the Buffalo Acad. of Nat. Sci., those of Vassar College, Mount Holyoke Seminary, Wellesley and Hamilton colleges, and the State Cabinet at Albany. The examination of these extensive collections furnished him with material for the determination of synonomy, which, had he lived to complete it, would have very greatly reduced the number of acknowledged species. In work of this character he was truly philosophic, and his opinions commanded and obtained respect. The great changes in scientific thought occasioned by the doctrines of evolution, found an ardent advocate in him, and those great principles formed the basis of all his later work. He has often remarked, and repeated it to others in his correspondence, that the great work of the future would be done from this standpoint, and "much remains to be done in eradicating the errors of the older naturalists." He was a conscientious worker, an acute thinker, and a man of great research. In the prosecution of his studies he was indefatigable, and here was the cause of his death—a nervous disorder which reached its climax in his death. He lived but five hours after the apoplectic stroke, and died without regaining consciousness. His merits were recognized by various scientific societies in electing him to a membership, among which were the Philadelphia Academy, the Boston Society Nat. Hist., the American Association for the Advancement of Science and the Buffalo Academy. To the publications of all these he was a contributor."

His collection of shells since his death has been kept in a mammoth cabinet of nearly 100 draws. While not one of the largest in the country by any means, still it is a valuable one on account of its *accuracy*. Dr. Lewis was a close personal friend of Dr. Lea who was our greatest living authority on the Uniodæ, and at least some of most every specie of Unio in the Lewis collection had at one time or another been verified by Dr. Lea. Again samples of a great many of the Lea types were presented to Dr. Lewis for services rendered.

The Unio covered some 500 species and 3000 specimens.

The American Land Shells were a fine lot and include 3000 specimens.

The American Fresh Water Shells outside of Unios compromised over 1500 entries and fully 10,000 shells. We have not ascertained how many species are represented.

While Dr. Lewis was a specialist on American Land and Fresh Water Shells, still during his long collecting experience he obtained many marine shells and also Foreign Land and Fresh Water shells. This branch of

the collection included considerable over 3000 species and fully 15,000 shells. Further particulars in the advertising column.

The Siphon of the Clam.

A few notes on the habits and collecting of the giant clam with elongated siphon found commonly at Long Beach, Calif. where the art of clamming is conducted in an interesting manner at times, may be of interest says C. F. Holder in the *Scientific American*. Instead of the single clammer on the beach at low tide, often a picturesque object from the dunes, we see a man plowing a long furrow in the sands, hoping in this way to throw up hundreds of the succulent bivalves.

To those who frequent muddy shores at low tide, the hole of the clam is a familiar sight. Sometimes the latter is discovered near the surface, ejecting a spurt of water; and strange clicking, sucking sounds, the dulcet voice of the clam, have been heard by those who, out of curiosity, frequent its haunts.

One of the most interesting features of all bivalves and of this clam in particular is the siphon, a singular continuation of the mantle, a fleshy chimney, so to speak, which enables the clam to rest at the bottom in security, and throw up this extension, and breathe and eat through it. The siphon in the cooked clam is a black, small and retracted object, projecting but slightly from the shell; it is known as the head, a misnomer, as it is really at the posterior opening of the shell, and opposite the place where the head, if there were one, should be.

The siphon is a long, muscular, and exceedingly tough tube, really an extension of the mantle which incloses the clam, and, in this instance, divided into two tubes. To fully understand its office a glance at the internal economy of the animal is necessary. Opening a clam, we find next to the shells a delicate gray mantle that encompasses the animal, so that it appears to be a bag holding the body of the clam and protecting it. At the posterior end the mantle is developed into the siphon, which contains two tubes. Opening the shell wider, we have the various parts before us. On the lower side is a muscular organ called the foot, that in some shells, as the razor clam, is an extraordinary member. This foot in some species, as the mussel, bears a remarkable gland which secrets a fluid that, when produced and exposed to the water, becomes a mass of dark, horny fibers that serve as anchor chains by which the animal attaches itself to the rocks. We find the mouth directly opposite the so-called siphon, provided with a pair of peculiar lips, leaf-like, which have the faculty of aiding in sending currents of water bearing food to the mouth. We see the long coiled intestine, the stomach, and liver, and in a bag or sac a marvelous rod, clear as crystal, seemingly distinct from the body and without purpose, a backbone unattached as it were, known as the crystalline style; an organ that is well known, but which is still a zoological mystery.

The heart is an interesting object, the blood pouring from the gills into the two auricles, then passing into the median ventricle, which pumps it into all parts of the body. The gills are prominent objects, apparently, hanging on either side, and made up of a marvelously complicated series of tubes. If in imagination we could follow the blood current of the clam, we should see it collecting in a large tube at the base of the gills, from which it passes into the tubes and so to the heart. During the passage throug the tubes which makes up the gills the process of breathing is accomplished, which brings us to the consideration of the long siphon of the clam.

This singular organ has various offices. It is like the trunk of an elephant, inasmuch as it can be elongated to obtain food at a distance from the body, illustrated by the clam at

the bottom of its burrow, while the tip of the pseudo trunk or siphon is at the opening receiving food The siphon has two tubes; the one furtherest from the hinge, or the lower, may be called the mouth proper, as it sucks in a continual current of water. The other performs an opposite work, rejecting the accumulation, and can be compared to a chimney, out of which passes the rejectamenta after consumption. In this one act of drawing water through its long siphon the clam eats and breathes. The water, laden with food and oxygen, is brought into the clam in a remarkable manner, which is readily observed. The gills and other parts of the clam are covered with minute, hair-like organs, which may be compared to oars, which all wave or work in a given direction, always away from the incurrent siphon opening, thus creating a current through it, the water from without rushing in to fill its place, and so powerfully do the cilia work that a few in a small section of the gills removed for the purpose have been known to move six millimeters in a minute. The water from the incurrent siphon, laden with food particles and charged with oxygen, is then wafted by millions of paddles over every portion of the gills, when the blood in the tubes takes up the oxygen and ejects the carbonic acid. On it passes, the cilia or paddles sweeping it on in the direction of the mouth, which, as it passes, seizes the atoms of food, the rejected portions, the impure water now laden with carbonic acid, being swept along and finally forced out of the upper tube of the siphon. So it will be seen that the perfect type of the siphon, with its two tubes, as illustrated by the clam, is a marvelous organ; and that the simple "head" of the clam, in popular parlance, is more like the tip of a long proboscis, really a very complicated and beautiful organ in all its parts, having various and important functions, interesting not only to the naturalist, but to any stroller along shore.

The mollusks are by no means the low creatures generally supposed. They are endowed with many senses; indeed, the wonderful siphon, like the trunk of the elephant, has such varied offices that it seems gifted with a special sense. The clam has olifactory organs, these being found in what is known as the parieto-splanchnic ganglia. It has minute eyes, in the pecten thirty or more are seen on the edge of the mantle, gleaming like gems. Sometimes the eyes are situated upon the siphon, as in the solen or razor clam. They are the simplest form of eyes, yet are sufficient to warn the owner, as every clammer knows, who has seen the wily razor dart down into its den as the shadow passed over it. The ears of the clam are delicate sacs, each containing an otolith, which, like the tongue of a bell, jangles against the cilia that line the sac, so producing sound waves.

A study of the siphons of the mollusks shows the greatest variety. The clam illustrates the maximum length. In the razor clam, ensis, and others, it is very short. In Tellina tenera the siphons are remarkably long, several times the length of the shell, and well illustrate the forms in which the siphons constitute separate tubes.

The Rose Tanager.

It was the good fortune of the writer on May 2, 1898 to observe a fine adult male specimen of Rose Tanager (*Pyranga æstiva*) in our localify. This was no may be so, nor perhaps it might be, as the specimen was so near as to place its identity beyond doubt. About 9 a. m. while standing on our front porch my attention was attracted by this bird in a maple tree that stood on the opposite side of the street. My first thought was how very early the Scarlet Tanager (*Pyranga rubra*) has arrived. At the same moment I observed the peculiar shade of color and

also that the black wings and tail were lacking and then in a second it occured to me what this visitor was. After hopping around for a short time it came across to my side oi the street alighted on a lilac tree not more than a rod from where I was standing. Here it remained hopping about several minutes enjoying the warm sunshine, thus giving me ample opportunity to note every difference between this and our common summer visitor and compare it with a specimen of the same species (*Pyranga æstiva*) which I have in my cabinet. This is the first specimen of the kind I have ever seen alive in Wisconsin and must have been here by mistake as Coues gives them as "Eastern U. S. strictly, and rather southerly, N. rarely to Conn."

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Goniobasis, Angretema, Lithasia, Trypanastoma, Schizastoma, Physa, Eurycodon, Lioplax, Anculosa, Strepobasis, Melantho, Valvata, Bythinella, Ancylus, Vivipara, Tulotoma, Limnæ, Amnicola, Gillia, Tryonia, Somatogyrus, Planorbis, Buliminus, Io, Sphaerium, Pisidium, etc., etc. In Land Shells we have a fine Strigosa series of 75 species and varieties. It is true a great many are now recognized as merely a color variety still they are a most interesting lot. In Foreign Shells, Land, Fresh Water and Marine we can surely interest you. Fine large series of Cypraea, Purpura, Murex, etc., etc. Many hundred species of bivalves. An immense lot of Helix, Partula, Clausilia, Cyclophorus, Bulimus, Orthalicus, Pupa, Pythia, Gibbus, Catanlus, Strophia, Megalomastoma, Cassidula, Pyrena, Pachychilus, Melania, Paludomus, Tonalia, Vivipara, Auricula, Cylindrella, Achatina, Ampullaria, Marissa, etc., etc. Space will not allow us to outline a hundredth part of the many good things.

We will add as a testimonial how the Lewis collection has been received by collectors in the past two weeks, one Western man ordered at once 1000 entries of the Strepomatidæ, two of a kind. A Pennsylvania man ordered a complete Lewis Type lot of the American Land Shells and a score of other collectors have ordered on approval sample lots in the particular lines they are most interested in.

We have not yet decided to break up the *Unioda**, but any collector who would like a slice, large or small, of this family in case we do break it up, should write at once and such will have first chance.

We have issued now a list of some American Fresh Water Shells which will be sent gratis.

WALTER F. WEBB, Mgr.,
Albion, N. Y.

* Since this paragraph was written the entire Lewis *Unioda* has been sold in a lump for cash.

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In the circle of the council, in the tumult of the skirmish, in the glare of burning cabins, on the trail of the despoiler, at the head of the army, in the mists of the rapids, in the shadows of the forests, in the sunshine of the prairies, on the summits of the mountains, the buckskin-clad figure was always to be found advising, aiding and leading for the good of men to come.

As civilization slowly crept westward and northward its guide and guarantee was a glimpse of the buckskin hunting shirt and the echo of the old long rifle Far in advance stole the trapper, blazing trails to the fat-lands, locating the sweet waters, learning the resources and mysteries of the new regions. The amount of good these men accomplished can hardly be over-estimated; they were the pioneers of progress upon this continent.—ED W. SANDYS, in *Outing* for November.

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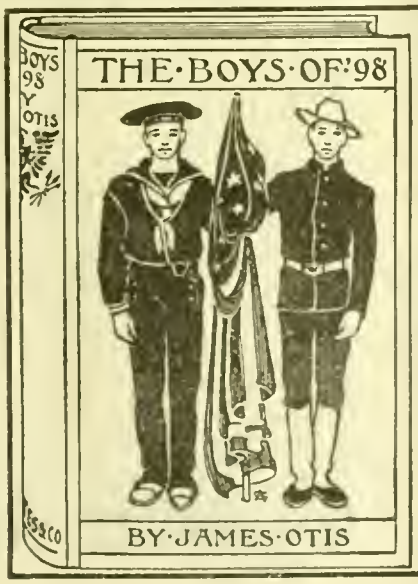

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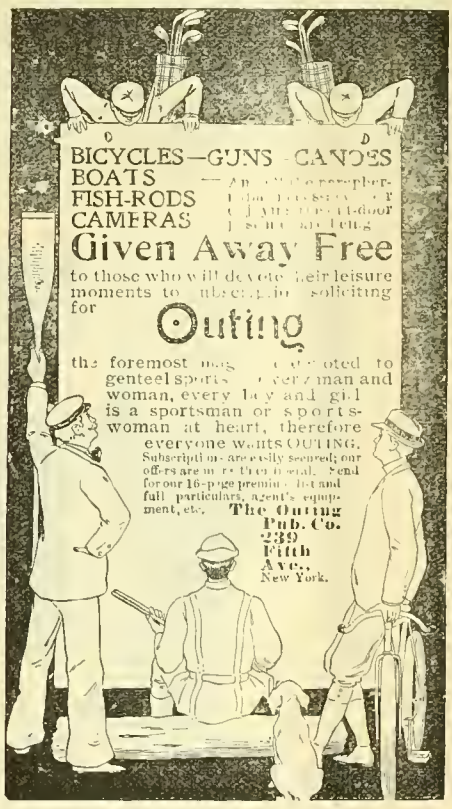
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Webb's Natural History Stock, Albion, New York.

VOL. V. NO. 3.

JANUARY, 1899.

THE MUSEUM

A Journal Devoted to Research in Natural Science.

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We desire to announce that owing to the many improvements made in the current volume of the **Fern Bulletin,** the price of sample copies will now be fifteen cents each. Purchasers of sample copies may deduct this sum from the regular subscription price when subscribing. The January number contains fourteen articles on ferns, many shorter notes, and eight pages devoted to the Mosses. Send for it. Address,

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THE MUSEUM.

WANTS, EXCHANGES AND FOR SALES.

All notices that come under above will be inserted in this department until further notice at one (1) cent a word. No notice less than 25c. Terms Cash with order. *No charge for address.* I shall at all times endeavor to keep parties, whose reputation is of a doubtful character from using these columns.

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NOTICE:—I would be pleased to correspond with anyone who can collect a large number of good curios for me within the next 8 or 9 months in exchange for same from this locality. W. H. HILLER, 147 W. 23d St., Los Angeles, Calif. 6tSept

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THE MUSEUM.

A Monthly Magazine Devoted to Research in Natural Science.

VOL. V. ALBION, N. Y., JANUARY 15, 1899. No. 3

A Brief History of the Gathering of Fresh-Water Pearls in the United States.

Natural and Artificial Replenishment of the Fresh Water Mussels.

BY GEORGE F. KUNZ.

The inquiry as to whether the exhausted beds recover, and in what time, is closely connected with the preceding one. It is unanswered in twenty-two of the papers, and seven others report no knowledge or opinion on the subject. Sixty-four replies are given, of which several are indefinite or conjectural. Out of about sixty papers, therefore—or about two-thirds of the whole—the following data is taken: Sixteen report the belief that the beds are replenished from year to year; four in one or two years; three in two or three years, and four in four years. Four name periods between four and eight years, and six between six and twelve years, and one gives twenty years, one twenty-five, and two estimate the recovery as requiring a century or more. Three papers say that many years are necessary; five say "a few" or "soon"; two report no exhaustion as noticed, and six report no recovery. Four papers are indefinite or uncertain. Two of the papers that give estimated date for recovery do so with an expression of doubt ("if at all," "if ever") as to whether it really occurs. The Tennessee paper before referred to says that the shells return each year, but in less numbers. As it is customary, more or less, to leave the young and small shells, the question resolves itself largely into two, namely: How far have they been carefully spared, and how long does it take them to retain their growth. This probably differs in different species, as it is estimated in some of the answers, and it may also be influenced by various external conditions. The Tennessee paper estimates the recovery as slow from the fact previously brought out very markedly that the young shells are those that are most exposed to all natural enemies and accidents. The New York paper, which thinks that there is no recovery, states that few young shells are found. A Texas pearler says that the young shells are found in two years, but contain no pearls. One (mentioned under the last head) says that many beds are recovering by the growth of the young that were left before. On the other hand, in Indiana, one states that when a bed has been worked out plenty are found the next season, and an Iowa pearler reports young shells abundant everywhere. One Tennessee answer gives a very fair average statement to the effect that the beds recover every season, and would perhaps recover entirely in a few years if not molested.

NATIONAL AND STATE PROTECTION.

The concluding inquiry, as to wheth-

er state protection of the beds is desirable or necessary, is answered with more or less definiteness in seventy-three papers, and, as might be expected on such a subject, with much diversity. Forty-six of the responses see no need of advantage from protection, and twenty-three favor it. One or two fail to understand the purpose of the question clearly, and some hold that, while not necessary now, it may be in the future. Two or three say that it would be difficut or impracticable. A few of the answers may be referred to more particularly. Of those that do not favor protection, two (Michigan and New York No. 1) think it not worth while or desirable to preserve the unios, the latter curiously remarking that "the water would be purer without them," and one Tennessee fisherman seems to hold a similar view, saying that protection is not desirable, though it is necessary to the preservation of the shells. Tennessee No. 74, failing to appreciate the question involved, opposes protection "because pearls bring in a great deal of money, and the mussels are of no use." Two or three think that the shells are inexhaustible and in no danger of extinction. One of those that favor the suggestion, Indiana No. 2, says that it would be well if no shells were taken for five years; the Ohio paper advocates "if the mussels are to be preserved." Tennessee No. — alludes to the value of the shells for pearl buttons as a reason for protection; Tennessee No. 32 and No. 33 advocates a limitation as to not opening young shells.

The whole question is curiously suggestive of the similar conditions in respect to forestry and lumbering—the apparently inexhaustible natural supply; the reckless prodigality and waste of such resources by man; the rapid diminution and impending extinction, which it would require years of labor to restore; the foresight and remonstrance of the few, and the indifference or opposition of the many, as to any limitation or protection designed to preserve the natural resources, and the ease with which they could be preserved by a few simple and intelligent modes of management, once established and made familiar to the people, and the pressing importance of some such action in place of the post nos siluvium at present prevailing.

APPROXIMATE YIELD OF PEARLS.

Only a few approximate figures can be given. The total production of pearls may be summed up as follows:

First—1856 excitement, $50,000, worth to-day at least four times that amount.

Second—1868 excitement, $50,000 worth.

Third—1889 Wisconsin excitement, perhaps $300,000 worth; the Tennessee fisheries, $100,000; Kentucky, $10,000; Texas, $20,000; Arkansas, $35,000, single pearls found in the past year selling for over $1,000, many over $100 and $200.

The great importance and value of a rural population obtaining ready money so easily as by pearling cannot be overestimated and is a great boon to the pearlers in the payment of taxes, interest and for such things as only money will buy. Therefore the protection of the pearling interests is one of great importance, as it opens up a new industry, if properly regulated, in which the product can always be sold for spot cash.

To conclude, it is interesting to note a few of the

FRAUDULENT AND ACCIDENTAL INTERMIXTURES WITH PEARLS.

In the small lots and packages of pearls that are sent to commercial centres for purchase or valuation and sale, quite a variety of foreign objects are found, some of which have evidently been introduced with fraudulent intent, while others have got among the pearls accidentally. Among the former are regular artificial pearls—that is, hollow beads of thin glass filled with wax or

other composition: also ground pieces of pearly shell or attached pearls that have been cut from the valve and rounded and polished on the defective side.

Frequently the round, hard lens of a fish's eye.

In the second class may be mentioned natural growths found in the shell, resembling brown pearls, translucent and consisting not of nacre, but of conchioline—the material of the hinge and ligament. These are sometimes handsome and lustrous, and occasionally indescent, but, of course, are not pearls and have no commercial value.

A third class of doubtful character consists of metallic objects that sometimes strongly resemble pearls and may have been introduced either by intention or accident. Such are small shot and steel spheres from "ball bearings"; these, when bright, look much like the darker and lighter gray pearls, respectively, and are frequently encountered.

END.

The Passenger Pigeon.

(*Ectopistes Migratorious.*)

This beautiful bird, once in such numbers throughout nearly the whole of the extensive region of the North American Continent, has now become almost extinct,—so far as can be learned—the species being very, very seldom seen or heard of, it seems a thousand pities that such should be the case. Trappers followed the birds with their nets to their rookeries every year, catching immense numbers which they shipped both dead and alive to New York, Boston and other large centers. They used wild decoy live birds and fed places for the netting. No doubt this constant pursuit accounts in some measure for their disappearance. Many reports have been published of late that these birds had appeared in numbers in Colorado and other sections, but on special inquiry being made, another of the Pigeon family (The Bandtail) were the ones seen. The last of the Passenger Pigeons seen by the writer was in the year 1885, when a little flock of seven flew towards a pine bush near Small's pond and within a few hundred yards of our city limits. The appearance of such old friends brought back many, many pleasant remembrances of the good old days when every year, about the month of April the flight of the birds began. It was about the year 1848 that I first remember seeing them. They continued steadily year after year to visit this section of country. The flight would continue for weeks, and many old residents as well as myself can safely testify to the immense flocks and countless numbers flying from East to West for hours at a time every day of the week, but it is hardly fair to ask people other than old residents to believe what is here stated. I have seen the birds fly along Queen street, West, morning after morning in almost one continued succession of flocks—many flying low down towards the roadway. Farmers and others used even (as far back as the year 1850) to catch great numbers in nets in the grain fields and other feeding places, and at that time I have seen wagon loads of the live birds taken into our market for sale loose in the conveyances and a net only used as covering to prevent the birds escaping. They sold for a trifle per dozen.

It must also be remembered that the birds were in immense numbers all over Canada as well as in this locality. Wilson, the great Ornithologist writes that in his day they visited and bred in almost every quarter of the United States, and he says in such prodigious numbers as almost to surpass belief and which had no parallel among any of the feathered tribes on the face of the earth. In the states of Ohio and Kentucky and Indiana Territory he saw them congregated in millions.

The birds would fly 60 to 80 miles for food in the morning and return in the evening of the same day. Thous-

ands of acres were covered by the roosts, trees would be broken down and killed with the weight of the birds, and the marks of desolation remained for many years, scarcely any growth of vegetation being seen on the spot. In Kentucky one roost not far from Shelbyville stretched through the woods for upwards of forty miles in hard wood and pin bush in a Northerly and Southerly direction, and was several miles in breadth. That was the 10th of April and the old and young birds left prior to the 25th of May. Some large trees had as many as one hundred nests therein. Beechnut, acorn, grain and berries formed their principal food and their nests consisted of a few dry twigs carelessly put together and so open that the young birds could be seen at all times from the ground. He (Wilson) made a calculation of the number of birds in one flight of about four hours, between Frankfort and Indiana Territory—the column was said to be one mile wide and he believed it to be much wider. This would give at a moderate calculation 2,230,272,000 pigeons as he remarks an almost incalculable inconceivable multitude, and yet probably far below the actual amount. Each bird consuming half a pint daily would equal 17,424,000 bushels per day. In 1876 and 1877 one roost or nesting place extended for over twenty-five miles in length and every tree in that distance had nests in it. It was computed that a compact mass of birds covered 5 by 1 mile in extent on their arrival. In the year 1876 a roost was begun near Goderich, Ontario, but numbers of sportsmen and farmers commenced firing guns at the birds before the nests were completed, so that the birds crossed the lake into Michigan and nested there. The last nesting or roost of any importance was in the State of Michigan in 1881, a few miles from Grand Traverse—it was about 8 miles long. In 1886 about 600 pair nested in a swamp at Lake City.

I lately heard of a few birds having been captured by some party living in the States and that he is now endeavoring to breed them with the object of re-stocking the country—a small begining for such an object when we take into consideration the vast array that formerly existed. You will notice a great similarity in the appearance of the Mourning Dove, a specimen of which is before you, but the size of the latter is very much smaller than the Pigeon.

JOHN MAUGHAN,
Toronto, Canada.

December 19, 1898.

Paper read at a meeting of the Biological Section of the "Canadian Institute," Toronto.

Facts About Sponges.

Although, in one form or another, the common sea sponge of commerce is a most familiar article, there are many people who do not know that it is the outer covering of an animal, albeit of a very low order in the scale of existence. The distinction between aquatic animals and plants is sometimes so fine that it is a matter of wonder that mistakes are not more often made by the naturalist, and in matter of the sponge it was only by applying the differential tests that the truth was ascertained.

The most conclusive proof that animal life exists in the sponge is that when burnt it gives off a smell as of burning hair or horn, and exact analysis shows it to be allied to these substances. Again, though a living sponge is fixed and apparently immovable, the holes in its surface are capable of opening and shutting, and from the largest of them a stream of water is expelled, by innumerable cavities, generally invisible except under the microscope. The sponge belonge to the order of Polypes, called the Asteroida, from the star-like appearance of the tentacles. Young sponges varying from microscopic size to that of a pin's head, swim freely about by means of

little waving hairs upon their surface, until they reach an age when they prefer security to independence, and monotony to danger. It has been proved that in every stage of their existence they live on solid food, and that while thus possessing all those characteristics that are more frequent among animals than plants, they never contain any traces of the cottony and woody substances, especially characteristic of the vegetable kingdom.

The manner in which the sponge obtains the food necessary for its existence is a wonderful illustration of the way in which nature provides for her children. The water entering the sponge by the small pores passes through a system of branching and fine canals, and is collected again by a similar system into the out-flowing pores. At the junction between the two systems of tubes are the most vital organs of the sponge, little swollen cavities of microscopic size, walled in with tiny living particles, each bearing a vibrating hair, with which it lashes on the current, and a transparent filmy skirt, with which it catches any food that may pass. All this labyrinth of canals and cavities is living soft flesh, and its movements are analogous to those which occur in certain other marine animals. To prevent its falling a prey to the first hungry animal that passes, it is set through and through with little flinty needles or thorns. During life the sponge of commerce shows only the largest of its numerous holes; over all the rest the dark slate-colored flesh forms a continuous film.

There are, it is asserted, 150 different species of sponge, but only a few are utilized in commerce. Of the different kinds the finest and most costly is the Levantine sponge, which is found in the Mediterranean. Extensive sponge fisheries are carried on in the waters about Florida, Cuba and Nassau. The fishery from the latter place is very valuable, giving employment to upwards of 6,000 men, including those who handle the sponges in their various stages and preparation for the market. The exports from Nassau range from $100,000 to $500,000 every year. The Florida fisheries are also very large. The commercial sponges found there are regarded as belonging to five different species. They all belong to the genus spongia, and named in the order of their importance, are as follows: Sheep's wool, velvet, yellow, grass and glove. The grass sponge is the most abundant of all the sponges found there. It is obtained in from three to ten feet of water. It attains a large size, and small grass sponges of four or five inches in diameter are of little or no commercial value. The best quality of sheep's wool sponges come from the small keys near Cedar Key, and is less abundant than the grass sponges. The velvet sponge is more limited in its distribution than the sheep's wool, and is said to be decreasing. It grows on live coral bottom in shallow water varying from three to twenty-five feet, the average size being about eight inches in diameter. The yellow sponge is a very common species, and, owing to the poor quality of those now taken, it is not much sought after by the fishermen. The glove sponge is the most circumscribed in its distribution of any of the Florida sponges, and commercially it is the least important.

The method of gathering sponges is by means of iron hooks attached to long poles. They are not poked about blindly at the bottom, as the oyster-man uses his tongs, for by the aid of a glass the fishermen are able to see every inch of the bottom, and deliberately selects his prey. The glasses are simple wooden boxes, a foot or more square, open at one end, and a pane of glass set in the other. Holding this perpendicularly over the water or slightly submerged, the fisherman is able to see everything on the ocean floor, no matter how many fathoms

down. Having determined what sponges to take, he reaches down with the long-handled hook and detaches them from the rock or coral to which they cling.

When first taken from the water the live sponge looks very little like the beautiful many celled soft article one uses. It is a flabby gelatinous mass, not very nice to look at, and when exposed to the sun for a short time emits an odor exceedingly offensive. When the sponge is sufficiently dead and dried up, it is placed in water and left to soak and be washed out.

After a day or two it is beaten with a stick to remove all remaining remnants of decayed matter; then, when quite clean, it is packed away and ready for the market. The price at the point of supply varies from $1.20 to $1.60 per pound, although during some recent years as much as $2 per pound has been paid. In 1895 the yield of all kinds of sponges in the Florida sponge fields was 280,372 pounds, having a first value of $344,-065. Practically the entire catch of the Florida sponges is sold locally to regular dealers at Key West. The catch is sold to the highest bidder. No opportunity is afforded the buyers to weigh the sponges, and the calculation of the quantity of each species and grade of sponge and the probable value of the cargo has to be made rapidly from a glance at each bunch.

The Mediterranean sponge differs from and is superior to those of Florida and the Bahamas, and it has been in contemplation to import living sponges from the Levant to Florida waters for propagation. Mutilation injures a living sponge but little. Divided with a sharp knife, even the smallest fragments retain their life, and under favorable conditions they will live and grow. Considering the many uses to which the sponge is put, and the fact that most of the Florida fields are overfished, there appears to be need for legislative action to protect the species.

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Walter F. Webb, Editor and Manager

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Notes Upon Bird Life in Yates Co., N. Y., Past and Present.

C. F. STONE.

Since the year 1894 this section of country has not had the usual rainfall nor enough snow to maintain our inland lakes at their normal levels, consequently each succeeding year they have reached lower levels until in 1895-6 when Lake Keuka at least reached a lower level than had been recorded before in about twenty years. As a result of this subsidance of the water the swamps have become drained so that fields of corn now wave their golden tassels and various kinds of garden truck flourishes, where in times gone by I have spent many happy hours shoving a boat through the dense growth of cattails or wading in the muck and water waist deep in my oological searches.

The Pied-bill Grebes and Florida Gallinules used to be common breeders while they now occur only as migrants. Virginia and Sora Rails were

abundant and prolific breeders, but now only three or four pairs can find a suitable nesting place. The American Bittern used to stake out his claims early in May although they did not breed here, but I have found them breeding in Potter swamp a few miles north of here.

Least Bitterns were abundant breeders and sometimes I have found six or eight nests in a small area; a sort of colony. Their platform like nests were fastened to cattails six to twenty inches above the water and always hidden in the densest tangle of cattails. I took one set on May 22nd but seldom were sets complete before the first week in June.

A few pairs of Black Ducks used to breed here and it was not an unusual sight to see a family of Wood Duck each season, but they were persistently hunted before the young ducks were half grown so they were driven to seek more secluded places long before their nesting sites were gone. However as bird life diminished in the swamp which was exposed by the receding water, became the scene of animation as hosts of shore-birds stopped here to feed and rest when on their mysterious semi-annual pilgrimage. These muddy flats abound with insects and moluscous life so that many shore birds remain here until the mud becomes frozen or until Nov. 1st.

During the last week of May 1895 a large flock of Least Sandpipers arrived accompanied by a few Sanderlings and about a dozen Black-bellied Plovers. On May 29 six Hudsonian Curlews joined the company and the rear guard of about fifty Turnstones arrived on June 1st. For about one week the sand-bar and mud-flats presented a scene of unwonted activity but by June 4th all had passed on to their northern breeding grounds, their departure probable being hastened because the news that "snipe" were plenty was a signal for every pot-hunter to sally forth with his gun, and many of these harmless and innocent birds were killed for eating purposes.

The fall movement begins early, even when many common birds are yet rearing their second brood and Goldfinches are just beginning to keep house. On the evening of July 28, 1897, I was considerably surprised to hear the tell-tale notes of a pair of Yellow-legged Plovers (*Totanus flavipes*) and an immediate visit to the mud-flats revealed a small flock of Least Sandpipers and Semi-palmated Plovers. Two Pectoral Sandpipers arrived on August 4th.

In 1898 the autumnal movement began even earlier. I began to visit the mud-flats by the middle of July so as to get the exact date of their arrival and I extract the following from my note book.

July 28. I heard the cries of Lesser Yellow legs. On the 26th, as I strolled along the shore this morning at sunrise I saw half a dozen Leasts and a Solitary Sandpiper. The latter was daintily feeding along the bank of the creek. I also saw a Lesser Yellow leg. Green Herons sneaked along out in the boggy and grassy water, some with folded necks and others with necks extended and ready to fly if I showed the least sign of being dangerous. Killdeers were there too, noisy and shy, keeping all the other birds posted on my movements. A few Spotted Sandpipers flew out in semi-circles as I approached.

July 31. With spy-glass I sat upon the sand-bar and watched the shore-birds digging in their Klondike after golden nuggets in the shape of molusca worms and insects. Three Lesser Yellow legs spent most of their time where the water was about two inches deep and upon the muddy shore, occasionally driving their bills full length into the oozy mud. Two stately Great Blue Herons promenaded back and forth. More Least Sandpipers are here and I saw several Solitary Sandpipers. Killdeers were busy and seemed to be guards for all the others.

Aug. 7. While watching the shore birds through a spy-glass, I saw a Green Heron spear two frogs and swallow them head first, but he killed them first by biting them with his bill. A Solitary Sandpiper was catching flies or some flying insect that swarm on the mud. He sneaked along with lowered and out stretched neck and when near enough he gave a little jump or sometimes just a dart of the bill. The Heron sneaked upon his victim too—his neck half stretched, his bright yellow eyes hypnotising the frog, then a sudden extension of his telescopic neck and the victim is deftly caught by his head, two or three bites and down he went, the Heron expressing his satisfacting by several energetic flips of his tail. When hunting in the water up to their bodies, their motions are so graceful and deliberate that they do not cause a ripple upon the waters surface.

Aug. 16. At 5 a. m. I was again along the marsh. There were fifteen Green Herons standing in as many different attitudes, strung along the shore. One Heron caught a frog by the hind leg and of course froggy kicked and the Heron gulped and tossed his victim around for nearly a minute before he could get him started down head first. Pectoral and Least Sandpipers are common, a few Solitarys and five or six Lesser Yellow legs with a big flock of Killdeers make up the company.

Sept. 9. During the past 10 days a lot of despicable pot-hunters have been shooting the shore birds without mercy. Up to Sep. 1st the Pectorals and other birds of shore loving habits have enjoyed a quiet peaceful time, and were getting used to my presence so that I could sit near and watch their interesting antics, even the shy and easily alarmed Killdeers would run near by without fearing me, but now they are slaughtered with such persistency that they are wild and suspicious of my every move although no harm was intended. Only a few Pectorals and Killdeers are here now. Even the harmless Green Heron went to satisfy the greed or sporting ? proclivities of the pot-hunters. This slaughter was kept up with such persistency that it was difficult to note the arrival of new migrants, but from Sept. 9th the following birds were observed: Black-bellied Plover, Golden Plover, Greater Yellow-legs, and on Sept. 29 I caught a wounded White-rumped Sandpiper. American Pipits are common autumnal migrants, and in October large flocks of Prairie horned Larks gather here. During the latter part of August and in September the American Goldfinches visit this muddy shore, alighting upon some log or old stump near the edge of the water and appears to find some kind of food that they eat with great relish.

Io and its Habits.*

In the mountainous region comprising portions of the States of Virginia, North Carolina, Tennesee and Kentucky arise numerous small streams which unite to form the principal rivers which are the head-waters of the Tennesee River. All these streams, not excepting the upper portions of the Tennesee River itself, have in a greater or less degree the characters of mountain torrents, which in reality they seem to be on a very grand scale. The streams have very usually a rapid descent, and are in many cases broken by shoals and rapids, the beds of the streams being usually coarse gravel or rock; there are seldom to be found stretches of placid water, and accordingly as might well be conjectured, the fauna of the region, so far at least as relates to fresh water mollusks, is somewhat peculiar. In the gravelly portions of some of the streams abound numerous species of

* This article was written 20 years ago by Dr. Jas. Lewis and published in the *American Naturalist*. Any of our readers who can add any further notes on this family we will be glad to receive them.

Unio; in bars and shoals are found immense numbers of operculate univalve mollusks, and in the rapids, especially in rocky portions of the principal rivers, are found the beautiful and interesting shells of species of Io, which are the largest and most attractive univalves of the family to which they belong. The earliest account we have of this group of shells may be found in the *Journal of the Academy of Natural Sciences*, November, 1825, in which Mr. Say described a species found in the North Fork of the Holston River in Virginia, calling it *Fusus fluvialis*. From that time until quite recently, additional species have from time to time been published, all of them being referred to the Holston River or more vaguely to "Tennesee." Even so late as 1873, there was only a single record showing that Io had been found in any stream other than the Holston River. The record here alluded to occurs in the *American Journal of Conchology*, vi. 223, and bears date October 24, 1870. If there were any persons aware of the occurrence of Io in streams other than the Holston River prior to that date, they probably had reasons for not publishing the fact. Since the date quoted, however, it has been ascertained that the distribution of Io extends to several streams in East Tennesee, rendering it quite probable that future exploration may lead to its detection in the southern part of Eastern Kentucky, and in the northern part of Western North Carolina. At the present time Io is known to occur in the following streams: North Fork of the Holston in Western Virginia; in the Holston River in East Tennesee; in the Tennesee River as far south as Bridgeport, Alabama; in the Nolachucky and French Broad Rivers in Jefferson County, Tenn.; in the Clinch River at Black's Ford, Anderson Co., Tenn.; and at William'sFord in Roane County, Tenn.; and in Powell's River at Kreasborn's Ferry, near the State of Kentucky.

Observers who have made any records of the habits of Io agree in stating that the shells are found only in swift water, though there appear to be discrepancies as to the abundance of specimens which may indicate that some localities are more favorable for them than others. It must be inferred that Io, living in streams the currents of which are very rapid, is specially organized and adapted to the situations in which it is found. Such, indeed, seems really to be the case; for a lady who collected specimens in some of the rivers of Tennesee wrote of them as follows: "The muscular power of Io is astonishing. I frequently find one adhering to a rock half as large as my head, and when I take up the shell it brings the rock with it, and requires much force to separate it."

It is somewhat strange that shells of so much beauty as some of the species of Io display are scarcely known to the inhabitants dwelling in the neighborhood of the streams in which they occur; yet it seems, from records made of the contents of ancient burial places, that they were known to the people who inhabited the country prior to the advent of European races. Mr. Lea, writing upon this subject, makes the following suggestive remark, which conveys a good deal in a few words: "Professor Troost informs me they [Ios] are rare in the river [Holston]; that they had been observed in the graves of the aborigines; and as it was generally believed that these were 'conch shells,' consequently coming from the sea, it was urged that the inhabitants who possessed them must come over the sea. It does not appear that they [Ios] had been observed in their native element, though living at the very doors of the persons who had remarked them in the tumuli." The impression that Io is a "sea-shell" is one that strikes most ordinary observers at first sight, as every collector who has them can testify.

Quite a considerable number of spe-

cies of Io may be found described and figured in various works treating on the shells of North America, and there is considerable diversity exhibited in their forms, sizes, colors and markings. There seems to be considerable difference of opinion among persons who have studied these shells as regards the number of species. There are some individuals who with apparent good reason believe that there is really only one species of typical Io, to which all the forms are subordinate as varieties; while on the other hand we shall find others who for reasons quite as good insist that there are five or more "good species."

The shells, taken by themselves, without regard to any facts relating to their habits, do not afford conclusive testimony as to species, as it is exceedingly difficult to isolate forms that cannot be made part of a continuous series when large numbers of shells are placed together. There are, however, some facts connected with geographical distribution and the association of varions forms, which seem to indicate conclusively that there are certainly two species; and, this being admitted, the logical inference might be, under all the circumstances which remain unconsidered, that there are more than two species. This, however, is a question which remains to be investigated. The facts upon which two species are inferred are the following: At Black's Ford, Clinch River, Anderson County, Tenn., two forms of Io constitute very nearly all that are found at that particular locality, and these two forms occur there in about equal numbers, and there are not associated with them any intermediate forms uniting the extremes. Thirty or forty miles down the river (following its winding course), at Williams' Ford in Roane County, those same two forms reappear, but their relative numbers have changed. At this point the form which seems to be identical with a shell figured by Reeve as *Io turrita* (not Mr. Anthony's species of that name, by any means) is the shell occurring in lowest numbers, while the prevailing form is a graceful, slender variety of the shell that Mr. Lea calls *spinosa*. The change in the relative abundance of two forms by a change of station seems to afford evidence relative to species. In following out the train of ideas which this suggests, it is perhaps appropriate in this connection to glance at the subject of geographical distribution as it relates to other forms, and suggest some of the conditions that seem to be correlated to the diverse forms. A little reflection will satisfy the most casual observer that the conditions under which Io is found are subject to variations of no small magnitude.

First to be considered is the climatic condition, affected by the combined influences of latitude and elevation, conspiring in the northern limit of the region inhabited by Io to produce a lower mean annual temperature than may be inferred at the southern limit. There may be in all a difference of four or five degrees of latitude, and possibly from two hundred to four hundred feet difference in elevation. In the northern portion of the area inhabited by Io are found those forms destitute of spines, associated with others in which the spines are only rudimentary or reduced to mere tubercles. To the southward, the smooth forms diminish in numbers, and disappear entirely before the central latitude of Tennesee is reached, and as a warmer climate is approached the development of the spines becomes more and more luxuriant. This is true of the Holston River in Virginia and Tennesee, and recent observations have detected a similar state of facts in the Clinch River and its tributary, Powell's River. Besides the influences of climate dependent on latitude and elevation, it may be conjectured that there are other influences affecting Io, some of them in a considerable degree depending on the animal properties of the water due to the variable qualities

of rock and soil among the mountains of that region. In evidence of this may be suggested the differences in size and appearance of shells from different streams.

In correlating these differences we shall find two most robust Ios in the Holston River. The roughest shells, as regards the whole surface, occur in French Broad River. The most slender and graceful forms are found in Clinch River. The smallest adult forms occur in Powell's River, where there are also other peculiarities observable that contrast curiously with what is known of Io elsewhere. The tubercular and spinous forms of Powell's River exhibit their characteristics (spines and tubercles) in a more rudimentary form than those found elsewhere, and on averaging the specimens it will be observed that they appear to have one whorl less, and more spines or tubercles on each whorl, than is observable in the more luxuriant forms of other localities. How much of all these differences in forms here suggested is ascribable to species is not at this time a subject of inquiry. In color, the shells of French Broad River are remarkable for green tints in the epidermis. In the Holston River the tints are somewhat ferruginous, but not to the same extent observable in the shells of Powell's River; while in Clinch River the epidermis is often of a bright yellow or orange, varied by livid tints which are partaken of by many other univalve mollusks inhabiting that stream.

The reader may possibly have felt, in reading a portion of this paper, some curiosity to know why Io occurs only in the upper waters of the Tennesee system of drainage. In the introductory paragraph of this paper it was stated that "all these streams, not excepting the upper portions of the Tennesee River itself, have in a greater or less degree the characters of mountain torrents, which in reality they seem to be on a very grand scale." From what we now know of Io we may infer that it cannot exist in placid rivers, and the limits of its distribution south in the Tennesee River depends on the character of the river. At the point where the Tennesee begins to be a majestic, placid stream, there Io ceases to extend its domain. This very simple inference is a key to the solution of other problems relating to the geographical distribution of allied forms in the same great family of mollusks. Very many of the univalve mollusks of the Tennesee drainage abound in swift shoal water, among rocks over which the water flows in broken torrents, and nowhere among still waters. The Tennesee River at Mussel Shoals is very prolific in various forms of mollusk life which delight in a rapid current; but below that point, in the navigable portions of the stream, very many of these interesting species disappear, because the conditions are no longer favorable to their existence.

Thus far, in the main, only the typical Io has been considered. There is another group of shells very nearly allied to Io, known by the generic designation *Angitrema*. Mr. Reeve regarded these shells as properly belonging in the genus Io; but his views do not seem to have met with much favor by writers on American conchology on this side of the Atlantic. Notwithstanding this evident difference of opinion, there is much reason for believing that Mr. Reeve's position is a good one, for some of the species of Angitrema are apparently related to Elk River, the Cumberland River, and some of its tributaries, as Io is to the head-waters of the Tennesee River. Indeed, it appears to be true that near the point where Io begins to disappear in the Tennesee River in Alabama, some of the forms of Angitrema replace it. The question of the relative distribution of Io and Angitrema, taken in connection with obvious resemblances in the shells detected by Mr. Reeve, seem to favor the suggestion that Angitrema is but a minor

phase of Io. In habits the animals, so far as is known, are somewhat similar to each other, with this difference, that Angitrema is fitted to dwell in more quiet waters than the necessities of Io require.

Taken in another aspect, the inquiry why Io should be confined apparently to the head-waters of the Tennesee River can be answered (in the proverbial Yankee style) by offering the inquiry why a curious group of shells with a fissured lip should be found only in the Coosa River in Alabama. This, like much more that might be made the subject of inquiry, is a part of the unwritten history of Io that remains to be investigated.

The reader who may desire to refer to a summary of what has been written on species of Io will find such information as is available for the purposes of a naturalist in a work entitled Strepomatidæ, by G. W. Tyron, Jr., Smithsonian Miscellaneous Collections No. 253.

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93	10 lbs. Stilbite, N. S	50
94	5 lbs. Spodumene, Mass	40
95	1 specimen Sulphur, 4x1	30
96	1 " " Crystal	15
97	1 " Tourmaline, Mass	25
98	1 " Tremolite	25
99	1 " Troosite Matrix Xtal	25
100	1 " Obsidian (10 lbs.) Mex	2 25
101	1 " Wollastonite	10
102	1 " Zincite, N. J	10
103	10 Zircon Crystals	35
104	10 lbs. Zoicite Mass	80
105	1 specimen Nuttallite, 1x5, 2 lbs., Mass	15
106	1 " Pink Wernerite, Mass	15
107	1 " Boltonite, Mass	12
108	1 Epidote in Actinolite, 4x6 3lbs., Mass.	25
109	1 Grey Epidote, Mass	25
110	1 Grey Epidote	25
111	1 specimen Kyanite, Conn., 1x5, 3 lbs.	25
113	1 " Magnesite, Greece	25
114	1 " Porphyretic Granite, N. H., 5x5, 5 lbs	20
115	1 specimen Apatite Crrstals, N. B., 2x3½	75
121	10 Arrowheads, different States	75
122	10 " Obsidian, Mexico	2 50
123	10 " " "	5 00
124	10 " " "	7 50
125	10 " " "	10 00
126	1 Obsidian Knife, Mexico	25
127	1 " " "	25
128	1 " " "	40
129	1 " " "	50
130	1 " " "	75
131	1 " " "	1 00

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142	Cooper's Hawk pouncing on Quail	5 00
133	American Goldeneye, Sea Duck	3 00
134	Murre, Common Guillemot	1 50
135	Rocky Mountain Screech Owl	5 00
136	Rose-breasted Grosbeak	1 00

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158	1 dozen Scalloped shells, pierced and polished	$ 25
159	1 Hermit Crab and Shell	10
160	1 Horse Shoe Crab, small	10
162	1 Sea Urchin [sand dollar]	05
162	1 dozen Skates eggs	10
167	½ dozen White Murex	58
168	½ dozen Pink Murex	68
171	1 doz. large Alligator Teeth	35
172	Large Turtle Shell [gopher] Fla	75
173	1 Saw-fish-saw, 11 inches, Fla	15
174	1 Trunk Fish, 7 " "	30
175	1 Porcupine Fish, 5 " "	25
177	1 piece Mexican Onyx, 8 square in	25
178	1 " " " 16 " " fine	1 00
179	10 " Fossil Coral, 50 svuare in., fine	2 00
184	1 Epidote, Mass., 5 inch, good	25
186	1 doz. Opals, Mexico	1 00
187	¼ doz. " "	1 00
189	¼ " precious Opals, Australia	1 00
190	½ " " "	1 50
191	1 " " "	1 50
192	2 " "	2 00
193	1 " "	2 00
194	1 " "	3 00
195	1 " " Mex. or Aus	5 00
196	1 " " "	10 00
187	1 Tourmaline, S. Paris, Me., fine, ½kt	8 00
200	1 " " " good ¼ "	2 00
201	1 Aquamarine " " fine 5/8 "	6 00
203	1 " " " " 3½ "	3 50
204	1 Red Carbuncle, 10mmx14mm, fine	1 50
208	1 American Turquoise, 3-16 in. x ½ fine	1 00
210	1 pr. Sardonyx for sleeve buttons, fine	25
211	1 pr. Onyx " " " "	25
212	1 oz. Rough Opals, specimens different colors to show all kinds and conditions	25
213	4 oz. better quality	50
214	4 oz. still better	1 00
216	1 Ruby specimen	20
219	1 Sapphire "	15
220	1 Diamond "	2 00
221	1 Tablecloth 6 yards long, 6 napkins. These were the property of Maxmillian and used by him in Mexico. Have the coat of arms of Austria. Are very heavy linen	75 00
226	½ doz. photo views of Providence	15
227	½ doz. books flowers of New England hand-painted, each	50
228	1 Arctic Fox Skin, white	5 50

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rite, Stephanite, Cerargyrite, Cryolite, Cuprite, Hydrocuprite, Zincite, Corundum, Hematite, Ilmenite, Magnetite, Chromite, Rutile, Pyrolusite, Limonite, Brucite, Gibbsite, Chalcophanite, Psilomelane, Wad, Siderite, Rhodochrosite, Smithsonite, Cerussite, Malachite, Azurite, Orthoclase, Spodumene, Rhodonite Babingtonite, Amphibole, Beryl, Iolite, Canerinite, Sodalite, Garnet, Crysolite, Wernerite, Vesuvianite, Andalusite, Silimanite, Cyanite, Datolite, Epidote, Prehnite, Tourmaline, red, green or blue Stauolite Crystal, Apophylite, Gemelinite, Analcite, Natrolite, Mesolite, Thompsonite, Chlorastrolite, Muscovite, Sterlingite, Pinite, Lepidolite, Biotite, Margarite, Seyberite, Phyllite, Clinoclore, Cornudophilite, Serpentine, Genthite, Melanosiderite Fergusonite, Columbite, Samarskite, Polymignite, Triphylite, Apatite, Pyromorphite, Amblygonite, Olivenite, Adamite, Dufrenite, Collophanite, Vivianite, Scorodite, Wavelite, Turquois, Childrenite, Sursexite, Howlite, Colemanite, Ulexite, Zosoite, Sapphire, Ruby, Opal, Agate, Moss Agate, Red and White Agate, Black and White Agate, Tiger Eye, Moonstone, Wood Agate, Opal Agate, Almandite, Pyrope.

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	Single specimens above	06
230	Last 10 of No. 229 above	1 25
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235	2 Reals Mexican	25
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237	" Obsidian "	50
238	" Serpentine "	35
239	" Galena "	40
240	" Graphite "	30
241	" Lepidolite "	25
242	" Smoky Quartz Group, 3x4	1 00
243	" Banded Agate "	75
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Two Insect Samsons.

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When Samson stood between the pillars of the temple of Dagon and "bowed himself," thereby occasioning the mighty pile to fall in ruins upon his head, as well as upon the heads of a multitude of his enemies, he evinced extraordinary and super-normal strength; yet it was my good fortune recently to witness exploits of great strength, by the side of which the captive Hebrew's avenging blow pales almost into utter insignificance. When I declare that the actors in these feats were two lowly "pinching bugs," I am afraid that some of my readers will declare that I am drawing on my imagination. And yet, that which I am about to relate can easily be verified by anyone who will take the trouble to investigate and to experiment.

Last summer I went to a "cake walk" which was given at night in the city park. I had secured a good viewpoint and was enjoying the amusing antics of a couple of cake walkers when I felt something alight on the collar of my outing shirt. The entertainment was in the open air, the walking course being one of the footpaths of the park, which was brilliantly illuminated. I had noticed many moths and beetles flying about the lights; so knew at once that my visitor was a "bug" of some kind. I put up my hand and seized it, when, suddenly, a spasm of pain darted from my finger tips to my shoulder. In my agony and surprise I emitted a yell which occasioned the two cake walkers to execute several steps not down in their repertory. On examination, I found that I had got the tip of my middle finger between the mandibles of the largest stag beetle (Lucanus elephas) that I had ever seen. His mandibles were carefully pried apart by a friend and my finger released. The size of the beetle was 2¼ inches long and $\frac{5}{8}$ of an inch broad. He is much more noticeable with his branching, staglike "horns" (which are not horns, but mandibles), broad, flatten-

ed, elephant-like head, and sturdy, polished legs and back, than the smaller female, whose mandibles are not branched and whose form is not so robust and formidable looking.

Unlike most of his congeners, the flight of Lucanus is almost without sound. I did not notice my visitor until I felt him on my collar. As soon this beetle thinks that it is in danger of an attack from any source, it will hold its head erect and widely open its mandibles. Along the inner margins of the latter the horney skin is exceedingly sensitive. As soon as it feels anything between them, it closes them with considerable force and power, as I can testify from sad experience.

While holding this beetle in my hand, I was greatly struck with the extraordinary strength of his legs. When I closed my fingers upon him, taking care that none of them came between his sharp and ever ready "nippers," he seemed to plow his way through the hollow of my fist without the slightest difficulty. Procuring a little tin wagon which weighed exactly two ounces (960 grains apothecary's weight), I fastened him to it with a quick-drying glue and two pieces of thread. He weighed only 31 grains, yet he walked away, drawing the little wagon, as though he were free and untrammeled. I then placed half an ounce of bird shot in the wagon; he seemed to recognize this additional weight, yet pulled it along without difficulty. I added another half ounce. This seemed to be the limit of his load, for he could barely move the wagon, though move it he did for one inch. Just think of it! Here is a creature weighing only 31 grains which pulled 1,410 grains one inch, measured distance. Do you not think that his feat ranks wfth, if it does not surpass, that of the famous Samson? I do.

I confined all of his legs save one, which I attached to a very delicate dynamometer. This leg was fully extended and the animal was then irritated. It pulled down, as shown by the dynamometer, 249 grains. A man weighing 240 pounds would have to lift very near 2,000 pounds—one ton —with one hand or one leg in order to equal the performance of this beetle.

The rhinoceros beetle (Dynastes tityrus), the second insect Samson to which I invite attention, differs from the first in many respects. Lucanus is jet black, with wing cases and legs highly polished; it is slender, and sometimes very quick in its movements. Dynastes, on the contrary, is yellowish gray in color, with wing cases splotched with black; its body is heavy and solid looking, and its movements are always slow and sedate. Unlike those of the stag beetle, the horns on the head and prothorax of the rhinoceros beetle are true horns and not mandibles. The top horn springs from the back of the creature's neck, as it were, while the lower horn grows from the back of its head. These horns are fixed and immovable and can only be made to approximate by movements of the beetle's head. Near the base of the upper horn are two short, thorn-like spines, one on each side. The female Dynastes is without horns.

The set (or sets) of muscles governing the action of the mandibles of L. elephas is very highly developed and is exceedingly strong. Especially is this true of the tendinous attachments of the muscles themselves, which seem part and parcel of the mandibles, so closely and intimately are they welded to them.

The anatomical appearance of these structures indicates great strength. This appearance is reality, for relatively the elephant beetle has more power in its "jaws" than the most ferocious bulldog that ever gripped a bone. Furthermore, this insect has all the "staying" qualities of its canine prototype; for, once having seized an object between its powerful pincers, its head may almost be torn from its body before it will relax its grasp.

I held this beetle between thumb and forefinger of my right hand, and

then brought the tip of my left thumb between its mandibles. These closed at once on the hard and calloused skin, the tips piercing through and through and meeting beneath the surface. By exerting no little force, during the exhibition of which the cervical attachments underwent considerable strain, the mandibles were dragged through the skin. Not till then did the creature separate them.

These members are powerful weapons of offense and defense, and one should carefully avoid them when examining this insect Samson.

The larva or grub of Dynastes is the largest of all the beetle grubs. The individual I have is very near two years old and will pupate during next winter. It will emerge a fully developed rhinoceros beetle about next May or June. When this grub is first hatched out, it is quite active, boring and eating its way through wood that is just beginning to decay. As it grows older, it becomes sluggish and seeks wood that is softer and more decayed; finally, just before it pupates, it seeks the rotten dust and broken up detritus of the cavity and there undergoes further metamorphosis. The grub was reared from the egg.

This giant among beetles is remarkably strong. After fastening it to the tin cart mentioned elsewhere in this paper, I placed in the little vehicle one ounce of bird shot. The beetle pulled this along without difficulty. I then placed a half ounce more of shot in the cart. This seemed to bring out the strength of the insect, for it bent to its work and clearly showed that it felt the additional weight very materially. Again I added a half ounce of shot. This seemed at first to bring the load to a weight beyond the creature's strength, but when I goaded it with an electric needle, it "bowed itself," even as Samson did between the pillars of Dagon, and pulled this, to it, enormous weight of one thousand nine hundred and twenty grains, a measured distance of two inches! The beetle weighed only one hundred and eight grains; consequently, it moved a weight eighteen times greater than its own. To equal this feat I would be compelled to drag a wagon and load which together weighed four thousand five hundred pounds! When we take into consideration that two thousand pounds is a heavy load for two strong draught horses, we can appreciate all the more what a wonderful exploit this was. This beetle showed a dynamometric strength of three hundred and ten grains for one of its fore legs.

In order to further test this insect's strength, I gently placed on its back a common paving brick weighing some four or five pounds. The beetle moved this brick perceptibly to and fro. If a man were to be subjected to a like experiment, the brick being as large in proportion to him as it was to the beetle, he would be crushed into a shapeless mass.

Principles of Animal Development

A Whelk's Egg.

"Omne vivum ex ovo" is now an ancient aphorism, says Prof. John Beard, of the Edinburg University in February *Natural Science*, and it has become a commonplace to say that the starting place of almost all animal development at the present time is the fertilized egg. The phenomena leading up to this need not concern us at present. Let us assume that we have got our fertilized egg, and let us in the first place consider what sort of a thing it is. If the choice of such an egg is given, how great is the variety out of which it may be selected. It may be the microscopically small egg of an Echinoderm, or one of larger size from the cocoon of an earth worm, the still bigger one from the leathery egg-case of a Whelk, or the huge one from the marvellous egg-capsule of a smooth Skate. It may be so large and contain so much poor material that the developing organism may feed upon it for two years, or so small and so des-

titute of nourishing substances that it can suffice for the needs of the development for but a few hours.

It may be destitue of any envelope beyond a thin structureless membrane formed by the egg-cell itself, or it may be closely wrapped up in a series of coverings, and outside of these we may find a shell or case of complex form and architecture.

The eggs of animals are, indeed, endless in variety, when the size, amount of food-yolk, coverings and appendages and the modes in which they are deposited are taken account of. But with all this one fact stands out very clearly, that the size, composition, mode of deposition, etc., of any particular egg, have an intimate relation and connection with the development of an individual of the species whose egg it is.

The individual peculiarities of ova raise various interesting questions which have hither to received out the barest consideration in embryological text-books and even in developmental researches. Probably for solutions of most of them the science will have long to wait. The nature of most modern embryological research is, unfortunately, not such as to furnish hints in the direction of their elucidation; the amount one man can accomplish, even if he be conscious of the existence and importance of the problems, is but the merest trifle, and his labors will require an enormous comparative material, if the results were to be of far reaching import.

These reasons, paradoxal though it may seem to be, impel the writer to attempt some sort of consideration of the subject. It might be made the work of a lifetime without evidence of exhaustion of the subject. If we are ever to have a true and real comparative embryology of organisms, as well as the existing comparative embryology of organs, many questions relating to the eggs of animals, will need to be cleared up.

Facts are to be found for the seeking; but as every conscientious embryologist realizes, the search nowadays, especially if it be in some definite direction, is often long and arduous. And the result often may be a single fact and a dozen new problems. Moreover, most of us have our plans of work mapped out for years to come, and have no desire to forsake the plot of ground which we have diligently and hopefully tilled, before we have reaped our little harvest. Therefore, since the problem of the individuality of eggs with which we have begun forms no intergral part of our personal task, what we have to say under this head partakes rather of the nature of incidental gleanings and musings than of deliberate investigation. We have attempted to enunciate some of the problems without pretending to do more than suggest what may be the nature of some of the solutions.

Examine on the sea-shore the egg-capsules of a dog-whelk (Purpura lapillus). If one of the freshly deposited cases be opened in its interior a large number of minute eggs may be counted. Some time later visit the same spot and open others belonging to the same bunch. The probability is that the enumeration of the developing organisms in all the egg-cases of the bunch will not give as large a number as that already recorded in the single freshly-deposited one.

This is of course an old story. The cannibalism of the developing young of the dog-whelk and whelk is one of the commonplaces of marine zoology.

Many years ago the writer endeavored to study it for himself, but as the examination of the cases was begun, when, as it turned out subsequently, the eliminative process was over, it was naturally not observed; although the facts were looked for until the young whelks emerged from their cases. The process on that occasion was not seen, simply because it happens at a very early period. One interesting little point, did, however, reveal itself, that the number of young

whelks within an egg-case was fairly constant, about five or six. If the process be mere cannibalism, it is not easy to perceive why it soould stop short, when some five or six larvae were left in the egg-case, why, as almost always happens in the case of the Alpine *Salamandra atra*, one should not devour the rest.

The number is so constant in the whelk, that one may suspect it is governed by some law. Probably too, if one counted them, the number destined to be devoured would be found to be equally constant. The whole process must take place under the workings of a law or laws, and it is part of our tasks as embryologists to try to find out what these are and what determines them.

If, after the examination of the whelk cases, a fully formed egg purse be taken from the oviduct of a dog-fish or skate, on opening this we shall almost certainly find but a single egg.

The eggs of different species of dog-fish or skate also differ considerably in size, both as regards the egg-cases and the yolks. These differences are not always in relation to the specific differences in size. The smooth skate (*R. batis*) is much larger than the starry ray, (*R. radiata*) but no proportion can be detected between the sizes of the two skate and those of their eggs. Indeed if we study the ripe eggs of two closely allied species of shark, *Mustelus vulgaris* and *M. laevis*, we find that, although, the two fishes are almost of identical size and so alike that no fisherman could ever be expected to distinguish between them, their eggs exhibit great differences in size along with almost inappreciable differences in the texture of the egg-capsule.

What, then, are the essential differences between the eggs of these two species? The egg-shell of *M. vulgaris* appears to be rather thicker than that of *M. laevis*, and—a very important point—the actual egg, the yolk, of the former is the equivalent in size and weight of about four of the latter.

This difference cannot be ascribed to the relative sizes of the two species, and, as a matter of fact, it is in association with a very fundimental difference in the mode of development.

Both species are viviparous, and it is possible that the young are born in both cases in the same condition of development, though this has yet to be determined. In *M. vulgaris* the yolk suffices for the whole of the uterine development, whereas in *M. laevis* it is used up long before uterine life is over, and for what is probably a long portion of its uterine existence the young *M. laevis* is nourished by a sort of placental attachment of its yolk-case to the uterine wall, as recorded by Aristotle, and as rediscovered during the present century by that great embryologist, Johannes Muller.

The instances above mentioned may serve as the text for further study. Modern embryology has never yet seen any difficulties or even any problems in the matter at all. We have our classifications of different kinds of eggs. We recognize eggs with little or no food-yolk, and those with much. Various forms of segmentation or cleavage of the egg are distinguished, such as equal or adequal, unequal but complete, and meroblastic or partial. Our leading text-books either say, or lead the reader to infer, that the differences between the various forms of cleavage are dependent upon the amount of food-yolk. As compared with the egg of a frog or toad that of a cod-fish contains but little food-yolk, yet the former exhibits unequal but complete cleavage, and the latter partial or meroblastic. Our classification may be convenient for purpose of elementary instruction, but it is purely empirical and has no real scientific basis.

It is like everything else. With the advance of knowledge, our conceptions of organic nature become enlarged, and we come more and more to perceive how adverse nature is to schematic and empirical classifications. But within recent years we have gone fur-

ther still in the use or abuse of food-yolk in embryonical science. It has even been made the basis of a phylogenetic tree of vertebrate ancestry. What more could be asked of it than this? The discoverer of this tree has indeed disowned and rejected the figment of his own imagination; but, this notwithstanding, from time to time it tries to blossom forth anew.

If it could be proved that, as we ascend the vertebrate scale, the food-yolk either increased or decreased in a regular and intelligible fashion, good reason might underlie its use in phylogenetic speculation. But if we attempt to evolve dog-fish and skate from lampreys by increasing the amount of food-yolk in the egg, ganoids from the former by again reducing it, and amphibians from these by a still further reduction, and by a new and enormous increase reptiles from amphibians, and so on to the end of the mammalian chapter, we are not really drawing upon an actual tangible, but limited, supply of food-yolk, but simply and solely on the intangible and unlimited resources of the imagination.

If it is suspected that the food-yolk of an egg has either increased or decreased, some cause must have been behind the change. It is only in fairly tales, such as that of "Aladdin and the Wonderful Lamp" that things come into existence from nowhere and out of nothing. As in physical science so also in natural science every effect has a cause and every effect is governed by a law or laws.

If the food-yolk of an egg can be shown to have increased in amount, we must not forget that the egg has had a history, in past times, and that a plus added to it at or during some epoch of time necessarily entails a minus or abstraction from something else at the same time.

That this must be so may not be obvious at the first glance. But it is all but certain that the cells in the oviary which feed the ovarian egg (follicle cells) or in other cases the ovarian cells consumed by the ovarian egg, are themselves rudimentary or degenerate or sterile eggs. And the amount of nourishment they can furnish in any given instance would seem to be definite and limited. If the egg of an animal increase in size and amount of food-yolk it may in all probability rightly be concluded that fewer eggs have been laid, and that in some form or other more incipient eggs have been used up in the process of forming the functional one.

This conclusion, or suspicion, brings us natnrally to the main points of our inquiry, i. e. to the modes in which food-yolk has been obtained, and an egg-capsule for the reception of a single egg evolved.

The simplest eggs are admittedly those, like the eggs of many echinoderms, which contain little or no food-yolk, possess only a single membrane formed by the egg itself, and are laid single, an egg-capsule being entirely absent.

It is always found that such simple eggs are laid in great numbers, for few or none have been rendered sterile, or degraded to serve as the food of others.

Naturally in such cases the developing organism can attain no great degree of complexity of structure before its original source of food-supply, that contained in the egg itself, is used up. The organism must then hatch out and seek food for itself from extraneous sources. Under these conditions the resulting organism possesses at its birth the simplest possible structure, that of a gastrula composed of two layers of cells and with an aperture leading into the gut.

Apparently there are two ways in which a further supply of food might be bestowed on the developing egg. Some of its fellows might be rendered sterile in the ovary, and there be used up, as in liver-flukes, tapeworms, insects, etc , to increase the food supply of the remaining functional eggs. Or,

a big batch of eggs being deposited together within a simple structureless cocoon, as in earth worms, leeches, the lug worm, and the whelk, some might be devoured by others to form a reserve supply of food, as in the case of the whelk.

Whether there is any connection between the two processes is a difficult question to decide. It may be that they have been separately evolved and that they have proceeded along parallell lines in their subsequent history. On the other hand, in some cases, at any rate, it is possible that the latter of the two processes was the original one, and that in course of time it has passed into the former.

If the indications are wanting, that the eggs of lampreys, ganoids, and bony fishes ever passed through the latter condition of being deposited in batches in simple cocoons, the evolution of a skate's egg and purse is only intelligible on this supposition.

Taking the latter process first of all, it will be noticed that it ultimately leads to two results—to the formation of a large-yolked egg and the evolution of a complicated egg-capsule for its reception.

In its very beginning the formation of a simple cocoon entails the co-operation of structures external to the ovary in the shape of genital ducts. These are necessary in order that a cocoon, however simple in form and structure, may be produced. It is the entire absence of such structure in connection with the eggs of lampreys, bony fishes, etc., which would appear to point to a different history of the yolk in these cases. Reverting to the cocoon, a very simple structure, formed by a genital duct, and containing a great number of small eggs with little food-yolk, may be looked upon as the beginning of the process. The lug-worm, *Arenicola*, furnishes an example.

Larvae are developed within the cocoon and live there as long as they have food to consume. If they then find no other nutriment within this structure they must emerge and seek for food elsewhere.

Further life within the cocoon is only possible on one or other of two conditions. The substance of the cocoon itself, or a part of it, i. e., all except its contex, may be of a nutritive value. This is so in certain leeches, for instance. Here the larvae, as soon as they reach the gastrula condition, proceed to gorge themselves with the semi-fluid "albumen" of the cocoon, and this food-supply suffices them until the young leech is formed.

But in some animals with simple cocoons the contents of the cocoon apart from the eggs appear to possess no nutritive properties. Undoubtedly it is to be looked upon as a secondary condition when the gelatinous "white" of the cocoon acquires a food value.

A parallell to this is seen in certain eggs of vertebrate animals. The egg-white of an Elasmobranch egg contains only the merest traces of albumen (Johnnes Muller) and is of no use as food. Whereas the same egg-white in a bird's egg is largely albuminous and very nutritive.

But in the simple cocoon, although the substance of this structure is sometimes of no value as food, there may be unfertilized or undeveloped eggs, or abnormal or degenerated larvae and these may serve as food for the normal ones. Thus, in the second way, the "birth-period" may be postponed.

There are well-known cases among the mullusca, Purpura and Buccinum, in which this "cannibalism" is the normal course of events. A few of the eggs in a cocoon develop quickly, and become gastrulae, with large mouths and muscular gullets. These few very soon use up their own food-supply, and then proceed to devour their fellows, which have either not developed at all, or only gone a little way. If this were carried to an extreme,—and it is probable that such cases do occur—it would end in their being only one developing organism left in the co-

coon, and this would be gorged with the food-yolk obtained by the annexation of its fellows.

The original cocoon by the solidification of its outer walls, its center remaining semi-fluid, might thus become an egg-case for a single egg. This would be realized in fact, if the eggs to be consumed, instead of being deposited as separate entities within the cocoon, were joined to or devoured by that single one which was destined to develop while in the ovary. The well-known instances of Hydra and Tubularia, with their ovarian "cannibalism" are obviously illustrative.

When this transference to the ovary of the process of devouring took place, is of course a moot question, but it must have happened at some time or other in many cases. The originally large number of eggs in the cocoon then becomes reduced to a single large one by the conversion of the rest into yolk-material in the ovary itself. And thus, having at first served a rather different purpose, the cocoon becomes an egg-case for a single egg.

Though such an egg containes a large amount of food-yolk in many instances, this cannot be retained during cleavage and the subsequent processes within the cells of the developing organism, and these act as if they were not connected with such an enormous mass of food. The egg now as in a skate, segments in a disc-like fashion, or is "meroblastic". The object of the developing organism now seems to be to regain possession of the food mass, which it had been obliged to relinquish during cleavage. This it does by forming once more a gastrula. The latter is flattened out on the top of the mass of yolk, and in order once more to annex this yolk, the gastrula must grow round and enclose it.

So that, if the mass of yolk be large, it appears to be a matter of indifference whether it be added to or devoured by the ovarian egg, or whether it be first obtained by the swallowing of other eggs within the cocoon or egg-case. For the latter case ultimately resolves itself in a mere modification of the latter. To put it in another way, the devouring of the yolk-mass has in both cases to be undertaken by the developing organism before it can be said to have obtained real possession of the yolk.

It is thus that the growth of a blastoderm, i. e., of a flattened gastrula over a yolk-sac, is exactly comparable to the devouring of yolk-masses by a whelk-gastrula. The end is the same, and probably the beginning was the same in both.

We have not got but a little distance along the path of evolution of animal eggs, and others interesting remain for examination. On another occasion the study of the purse of a dog-fish or skate may engage our attention. From this we may pass to the consideration of the egg of a mammal, and finally, this should lead to the elucidation of some of the principles underlying mammalian development.

Food-yolk will here again be found to form an integral part of the programme, and we may perhaps come to realize with what nicety nature bestows it on animal eggs. And if we glean nothing else, we may at least learn to realize that the reign of law pervades animal development from its commencement to its close.

Notes on the Helix of the West Indian Islands, Including Central and South America.

During the last few years the study of the family *Helicidæ* has been taken up quite generally by conchologists the world over, and we feel that no excuses are necessary, in giving to our readers a few facts concerning the Helix of the region named above. All of the area south of the U. S. including the West India Islands, and South America, with its adjoining Island groups, are included in what is termed, the West India fauna. We know no

reason why it is thus termed, unless it be that out of three hundred odd species, over two-thirds of them are found in the West Indies.

The Species found in this territory are divided into four large groups, as follows: *Hemitrochus*, with 94 species: *Polymita* with four species; *Thelidomus*, with 173 species and *Solaropsis*, with 32 species.

Taking them in the order named, we have the group *Hemitrochus* first. For convenience it has been divided into six sections, the first of which is *Cysticopsis* MORCH. The type of this section is *Helix Cubensis*, PFR. Sixteen good species are recorded with some varieties. *Helix Macmurryi*, C. B. AD. is the largest of the section being fully an inch and a half across, covered with a yellowish chestnut colored cuticle, which easily rubs off. Most of the species run from ½ to one inch, and are found in Cuba and Jamaica. Section 2 is *Plagioptycha*, PFR. Twenty-two species and varieties are recorded of which *Helix indistincta*, FER. is the Type. This species is about one-half inch across, depressed, thin, sub-translucent, brownish, horn-color. The species of this section are nearly all from Hayti. Section three is *Hemitrochus*, SWAIN. of which *Helix varians*, MKE. is the type. 29 species and varieties are recorded. The most common kinds being *varians*, MKE., *Troscheli*, PFR., *gilva*, FER., *graminicola*, C. B. AD., etc. The whole section range about one-half inch in diameter. Section four is *Dialeuca* ALBERS of which *Helix nemoraloides*, C. B. AD. is the type. Nine species and varieties are recorded, and range about three-fourth inch in diameter. All are from Jamaica. Section five, *Coryda*, ALBERS, contains 11 species. *Helix alauda*, FER. is the type. As a class they are handsome, but not easy to secure. Nearly all come from Cuba, *alauda* being the most common, and showing the most wonderful variation. Section six *Jeanneretia*, PFR. contains eight species. The type is *Helix multistriata*, DESH. This is a brownish, lined species one inch across. Five of the eight species come from West Cuba, the others from the Isle of Pines, and Porto Rico.

Group second, *Polymita*, BECK. have only four good species accorded to it. The type is *Helix picta*, BORN. and the other three species are *Helix versicolor*, BORN., *H. muscarium*, LEA. and *H. Brocheri*, GUT. They are all readily distinguished on account of their brilliant colors. All are fairly common, being a native of Cuba. They are without any prominent lip, rather thin but solid, and invariably brillianted painted. In *Helix picta* alone, one may easily select twenty distinct forms of coloration.

Group three, *Thelidomus*, SWAIN, is a large one. The shells are as a rule of good size, semi-globose, and are confined mainly to the West Indies in distribution. The group has been subdivided into ten sections, each showing some prominent characteristic. Section 1, is *Thelidomus*, SWAIN, proper, and *Helix inserta*, FER. is the type. Nineteen specimens and varieties are given place here, the most prominent besides the type are *H. lima*, FER., *H. aspera*, FER., *H. discolor*, FER., *H. auricoma*, FER., *H. provisoria*, FER., etc. All are good size, yellowish to brown-colored shells. Section 2, *Parthena*, ALB., contains 11 species, mostly from Jamaica and Porto Rico. *Helix angulata*, FER., is now considered the type. Other prominent species are *H. dominicensis*, *H. dissita*, DESH., *H. undulata*, FER., *H. Jamaicensis*, GMEL. They range from ½ 1½ inches in size. Section three, *Polydontes*, only contains three species, but all of large size. *Helix imperator*, MONT., is the type, and to our mind the most imposing Helix in the whole West Indian Group, although some are larger. All come from Cuba, The other two species are *H. apollo*, PFR., from E. Cuba, and *H. sobrina*, FER., from Santaigo.

Section four, *Dentellaria*, SCHM., contains 17 species, and a most interesting lot they are. *H. nuxdenticulata*, CHEM., is the type, but is not so often found in collections as are *H. obesa*, BECK., *H. dentiens*, FER., *H. isabella*, FER., *H. orbiculata*, FER., *H. badia*, FER., *H. lychunchus*, MULL., *H. Josephinae*, FER., *H. perplexa*, FER., and others. The section is mostly from Martinique Island, a few coming from Grenada, Antiqua, Dominica, etc. They are thick, stout, heavy lipped shells, of a brownish color, and showing numerous folds or teeth, somewhat similar to the American Genus Polygyra. Section 5, *Cepolis*, MONT., contains 8 species, of which *H. cepa*, MULL., is the type. They are mostly from Jamaica and Porto Rico. They range from medium to large, are thick lipped, and show many of the folds of the preceding section. Section 6, *Lucerna*, SWAIN, contains 41 species and varieties, many of which are large and imposing shells. The type, *H. acuta*, LAM., is one of the largest and finest in the section. Nearly if not all of the section are from Jamaica. The shells are mostly deep brownish color, and shiny, still some are beautifully banded with yellow and other colors. *H. soror*, FER., and *H. bronni*, PFR., being of the latter class. Near relatives to the type, are *H. lucerna*, MULL., *H. Chemnitziana*, PFR., etc., *H. valida*, C. B. Ad., *H. sinuata*, MULL., *H. sinuosa*, FER,, and *H. invalida*, C. B. Ad., are also after the *H. acuta* style, but much smaller in size. Section 7, *Caracollus*, MONT., are also large shells, and in some cases very handsome. 15 species and varieties are given, of which the large and imposing *H. carocolla*, LINN., is the type. They are mostly from Eastern Cuba and Hayti. Part of the section are large brownish shells, the balance, being beautifully banded. Section 8, *Oxchona*, MORCH., contains 8 species of beautiful color from Brazil, Costa Rica, Mexico, etc. They are in form the shape of a trochus, with a pointed elevated spire. They approach more nearly the beautiful trochoidal specimens of the Solomon Isles than any others with which I am familiar. *H. bifasciata*, BURROW., from Brazil is the type. It is of a milky white, spirally encircled by dark purplish-brown narrow bands, and lines. Section 9, *Isomeria*, ALBERS., contains 34 species. They are mostly large, dark, chestnut or chocolate-colored shells, confined to the Andes of Peru, Ecuador and Colombia, allied to the Labyrinthus, but with the mouth parts less developed, the teeth when present being generally small. The type is *H. orcas*, KOCH. This is a large shell nearly two inches in diameter, deep, rich chestnut-brown color, spire depressed, etc. The section as a whole are hard to obtain and I am sorry to say almost unrepresented in my collection. Section 10, *Labyrinthus*, BECK., contains 20 species. *H. labyrinthus*, DESH., from Ecuador, is the type. The section as a whole inhabits that portion of Northern South America, not inhabited by species of *Isomeria*, and generally less elevated country than the mountainous Andean region, to which the latter group is confined. The main characteristic, is that the teeth are more developed than *Isomeria*, otherwise the two sections have much in common.

Group four, and last, is *Solaropsis*, BECK. Thirty species are given, of which the type is *H. pellisserpentis*, CHEM. They are mostly forest snails, living on the ground under stones and in hollow trees. As a rule are handsome, being of a type not easily described. *H. pellisserpentis*, CHEM., is a depressed, convex species, about 1½ inches across, light brownish, with ill-defined narrow streaks following the lines of growth, a series of chestnut arrow-shaped spots below the sutures and a similar narrow one at the periphery. *H. Braziliana*, DESH., is also quite typical of the section. The species mostly come from Brazil, Ecuador, Arg. Republic, etc.

Our readers will readily infer from the brief synopsis we have given of the West Indies, Helix fauna, that it is impossible to do justice to such a varied and interesting group, in a short article. If, however, by the aid of the notes given my collecting friends, who do not have access to the large and costly works, may more readily arrange their Helix from this area and thereby make them of renewed interest, I shall feel well repaid. If my readers, would like me to arrange a similar synopsis of the Chinese, Japanese, East Indian Islands, African and Australian groups, I shall take pleasure in doing so and shall be pleased to hear from those interested. Most of the present synopsis has been gleaned from my own collection with the aid of Tryons' invaluable Manual.

WALTER F. WEBB.

Raising Ferns from Spores.

Through the kindness of a friend, fifty varieties of fern seed were received from Australia, I think from some government garden there. In some packages were spores only, varying much in color; and in others were pieces of fronds, with spores attached, the whole plainly showing great care in collecting and marking. Having an especial liking for ferns, I think I was never more pleased in receiving anything in the horticultural line, than in getting these seeds. I took fifty smallest size pots, filled them half up with broken cinders, laid a little sphagnum moss on top, and on the moss a thin layer of loam and sand. On this I scattered the spores, using great care in cleansing the hands, and carefully folding away each paper before taking another. The pots were then plunged in a box of damp ashes, and a large light of glass placed over the box. This glass was hardly lifted till the seeds had started, and after that, only an inch or so at long intervals. In due time (quite a long time, however,) every pot was covered with a growth of seedling ferns, and I rejoiced in the probable possession of some rare varieties. When the plants were some two inches high, they possessed a suspicious sameness, and the suspicion gave way to certainty later on, when I found that all but five of the pots had only *Pteris tremula* in them. Of the five others only two were new to me. I had no plant of *Pteris tremula* in the greenhouse, but there was a package of seed with the others. Discouraged, but not quite dismayed, I, next season, selected twenty-five of the choicest sorts, and sowed as before. Again every pot was full, but this time all were *Pteris longifolia*, of which I had several plants in the greenhouse, but had scattered no seed. I didn't try it again.

Several sorts of well-known ferns always multiplied in the greenhouse, but never where I had sown the seed. They seemed to have a preference for the sides of the pots containing other plants. I suppose I have sown enough seeds of the Mexican tree-fern, *Cibotium glaucum*, to get, perhaps, a million plants, but I never found but one, and that in an out-of-the-way place. So I think the deliberate sowing of fern seed is mostly wasted time.

Animal Life in the Olympian Mountains.

Mr. D. G. Elliot, who went to the Northwest last summer in the interest of the Field Columbian Museum, under date of September 13, '98, writes as follows:

"The expedition to the Olympian Mountains, which I am at present conducting, has thus far secured five hundred skins of deers, carnivora, and rodents, which collection we hope to increase considerably before our labors are ended. This collection is exceedingly valuable, coming as it does from hitherto unknown localities where no naturalist has ever penetrated. There are probably species new to science among them, but how many cannot

be determined until they have been examined and compared with other material. The country in which these have been procured is the roughest and most difficult to traverse that I have ever seen, and my experience in the various mountain ranges of North America has been very extensive. A great portion of the Olympians is absolutely impassible, and we have reached a point beyond which nothing, unless provided with wings, can go, while from our camp we can look over a vast extent of the range totally unknown and unapproachable. A naturalist, therefore, can fully appreciate the value of the material we have secured. Even if already known, specimens coming from such localities are of almost as much value as if undescribed, and will prove of great assistance in settling questions of geographical distribution and others of equal importance. Snakes and batrachians are not plenty in the range, but we have secured some of both, which I am sure will prove of much interest, and I hope to be able to obtain some of the fishes of this region."

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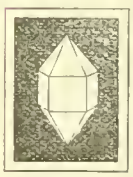

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THE MUSEUM.

A Monthly Magazine Devoted to Research in Natural Science.

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THE MUSEUM.

A Monthly Magazine devoted to Ornithology, Oology, Mollusca, Echinodermata, Mineralogy and Allied Sciences.

Walter F. Webb, Editor and Manager

Albion, N. Y.

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Revision of the Chickarees or North American Red Squirrels.*

The Red Squirrels or Chickarees are the smallest of the true squirrels in North America, and are distinguished not only by small size but by the possession of a relatively short tail and a rather distinctive pattern of coloration. These features are combined with a reduced upper pre-molar, which is not only so minute as to be non-functional but is often absent either on one or both sides of the jaw, being wanting in about thirty per cent. of the specimens examined, throughout the group, regardless of the species. The only wonder is that so functionless an organ should persist so uniformly over such a large geographical area, while size and color are more or less variable. In view of these combined peculiarities Trouessart in 1880, very properly raised the group to the rank of a sub-genus under the name *Tamiasciurus*. It is confined to northern North America and embraces several species and a considerable number of sub-species.

In 1877 the present writer reduced the three species to one with two additional sub-species. During the following twenty years a considerable number of new forms were described, so that at the close of 1897 some twelve forms were current to which five are now added.

During the last ten years material relating to the Chickarees has rapidly accumulated. In 1877 I had before me all the specimens then extant in the larger museums of the country, aggregating about 390, of which about 90 were skulls without skins. The skins were mostly in bad condition, such as now would be regarded practically worthless in comparison with the standard now demanded. Many were without definite localities and a much larger number without date of collecting. Little was then known or could readily be learned from the material then available, regarding the striking seasonal changes of coloration that characterize these animals. In recent years this has been made a matter of careful investigation, and new light has thus been thrown upon the character of otherwise misleading specimens. With now about four

*(The following notes are taken from Prof. J. A. Allen's article in the Bulletin for 1898 of the American Museum of Natural History. Notes on mammals are so scarce, we think the following will be read with interest by many of our readers.)

times the number of specimens in hand, nearly all of satisfactory character, it is a pleasure to again retrace the work of two decades ago; and while the material is still grossly inadequate, it suffices to amend at many points former erroneous conclusions. For example, there are very few specimens as yet available from New Mexico and Utah, practically none from Nevada, and important areas of large extent in Oregon, Washington and British Columbia are unrepresented as are also some of the outlying buttes and mountain ranges east of the Rocky Mountains in Montana and Wyoming.

The sub-genus *Tamiasciurus* is a compact group, its members presenting many features in common, while others are distinctively characteristic of particular sections of the group. The 17 types here recognized cluster around three principal types from which they have obviously been derived. namely: *Sciurus hudsonicus*, *Sciurus fremonti* and *Sciurus douglasii*. These three types, so far as now appears, do not intergrade, although obviously derived from a common ancester, at some not very remote period.

All the forms undergo marked seasonal changes in color, but they are approximately parallel in all the forms, so that when once understood for one form, a key is available for the others. In winter the ears are rather prominently tufted, but they are tuftless at the height of summer pelage. The soles of the feet are heavily furred in winter, especially at the northward, and comparatively naked in summer. In winter the pelage is much thicker, longer and softer than in summer, there being two annual moults. The winter pelage is retained until late in the season, especially at the northward and in the mountainous districts, where the winter coat remains practically intact, though more or less worn and bleached, until June, and more or less of it often remains till late in July. The acquisition of the full summer pelage is thus delayed till late in August or even later, and the new winter coat is not much developed till into November, and is usually not perfect till late in December. The black lateral line, present in all the forms in summer, is irregularly obsolete in winter, sometimes only a trace lingering, while sometimes (apparently in animals born the previous year) it is well pronounced and several of the western forms is never so much obscured in winter as it is at the same season in the eastern forms.

Sciurus hudsonicus, (Exrl.) NORTHERN CHICKAREE: Range, Northern New England, Northern New York, Northern Ontario and Northern Minnesota, northward including Alaska north of the Alaska mountains. Probably also outlying areas in the Adirondack region and in parts of the Appalachian Highlands. Toward the southern border of this general area, it generally merges into *S. hudsonicus loquax*. Winter pelage. Above with a brown medium band of rufous, varying from light yellowish rufous, extending from top of head nearly to end of tail: sides of body and outer surface of limbs to the toes olivaceous gray, the hairs plumbeous at base, then alternately ringed with a very pale tint of yellowish and black, and slightly tipped with black; ear tufts dusky, the hairs slightly tipped with rufous. Below, grayish white and conspicuously ringed with black, giving a general greyish effect. Tail above with a broad central area of yellowish rufous, bordered with a band of black, widening at the tip into a broad sub-terminal bar, with a conspicuous outer fringe of pale yellowish rufous, lighter than the central area; below the outer fringe nearly as above. Post-breeding or summer pelage, whole upper surface, including flanks, pale yellowish rufous, strongest and brightest on outer surface of limbs and feet; a conspicuous black lateral line; ventral surface pure white; ears like the back and without ear tufts; tail colored

nearly as in winter but narrower and legs full.

Sciurus hudsonicus loquax, Bangs, SOUTHERN CHICKAREE. Winter pelage similar to that of *S. hudsonicus* proper, but the medium dorsal band is a brighter, deeper red, and the rest of the upper surface more yellowish and olivaceous, with the black annulations narrower; below with the white much less strongly vermiculated with black; central area of tail above more strongly reddish. The sub-marginal zone of the tail is narrower and the red hairs of the central area are clear red, i. e. not ringed with black. Summer pelage. In general much redder and more brightly colored. General coloration above, strong reddish yellow; feet ochraceous or reddish ochraceous, this color extending up to the fore arm and leg; below clear white.

The range is the Alleghanian and Carolinean faunæ of the humid province Red squirrels from Massachusetts, New York, New Jersey, the states bordering the Great Lakes, southern Ontario and thence westward to Wisconsin and southern Minnesota and southward to the Appalachian Highlands, are quite different in coloration from the Red Squirrels of Arctic America (Labrador west to Alaska) in both winter and summer pelages, the northern form being much paler in general coloration than the southern.

Sciurus hudsonicus dakotensis, Allen, BLACK HILLS CHICKAREE. Winter pelage. Median dorsal band light yellowish rufous; rest of upper parts and outside of limbs and feet yellowish gray, the hairs fulvous narrowly ringed with black; ventral surface clear white; tail above with the central area like the back, the black border narrow, fringed with fulvous; tail below with the central area pale gray basally, passing into very pale fulvous distally; bordered and fringed as above. Summer pelage. Above pale yellowish olivaceous gray, the hairs finely annulated with black; feet, outside of shoulders and edge of thighs yellowish rufous; lateral line obsolete (wanting in 12 specimens out of the 18 examined and clearly indicated in only two, both young of the year) ventral surface pure white; tail above bright yellowish rufous, much lighter than in the northern *S. hudsonicus* and eastern *S. hudsonicus loquax*, with the usual narrow black sub-marginal band and yellow fringe; tail below, with the central area grizzled yellowish and black. Geographical range the Black Hills of South Dakota and adjoining portions of Wyoming.

Sciurus hudsonicus baileyi, subspecies nov. BAILEY'S CHICKAREE. Winter pelage. Above with a broad median reddish band; rest of dorsal surface pale yellowish gray; below, white, finely vermiculated with black. Summer pelage. Above, yellowish olivaceous, the hairs pale yellow narrowly ringed with black; fore and hind feet ochraceous orange to reddish orange, this color extending to the shoulders and edge of thighs; a distinct blackish lateral line (present in at least 90 per cent. of the specimens) below, white, usually with a distinct dash of yellow; tail above with the central area dark cherry red, varying to yellowish red, and extending about three-fourths the length of the tail; some of the hairs being, however, narrowly fringed with black, giving a grizzled effect, central area bordered by a zone of black, with an outer, rather broad fringe of pale yellow; lower surface of tail pale yellowish gray, slightly grizzled with black as above with a black band and a pale yellow fringe. Geographical range, outlying mountain ranges of central Wyoming and eastern Montana, and northward into Alberta in the eastern foothills of the Rocky Mountains. Its range includes the Bighorn, Pryer and Laramie Mountains in Wyoming and the Big Snow, Bear Paw and Little Rocky Mountains in Montana and probably other outlying, pine covered buttes and hills. *Sciurus*

hudsonicus baileyi probably intergrades at the north with the true *S. hudsonicus* from which it differs in summer pelage, in the more olivaceous and darker tint of the dorsal surface, in the pale fulvous wash of the ventral surface, and in the red and black grizzled upper surface of the tail. It differs similarly. but in a greater degree, from *S. h. dakotensis*, which is a much paler form. With *S. h. richardsonii* it scarcely needs comparison, owing to the darker, deeper red of the upper parts of the latter and its much greater amount of black in the tail. Its nearest ally is *S. h. ventorum* which is geographically its near neighbor at the southeast, finding its eastern limit in the Wind River Mountains while *S. h. baileyi* occupies the Laramie and Bighorn Mountains a little farther to the eastward. The chief difference between these two forms consists in the less yellowish and decidedly darker olivaceous cast of the dorsal surface of *S. h. ventorum* in summer pelage, and the grayness of the lower surface of the tail. What the difference in winter pelage may be cannot now be determined, owing to lack of material.

Sciurus hudsonicus ventorum, subspecies, nov. WIND RIVER MOUNTAINS CHICKAREE. The winter pelage is not well known yet. Above with a narrow median band of dark colored rufous, narrower and less dark than in *S. h. richardsonii* but much darker and less yellowish than in *S. h. baileyi*; rest of dorsal surface and legs and feet gray, suffused with pale yellowish, the hairs being yellowish gray ringed with black; a dusky lateral line obscurely indicated; below white without (in the specimens examined) black vermiculation; tail above centrally dark yellowish rufous, bounded by the usual zone of black and pale yellowish outer fringe, the black zone being of about the usual width in *S. hudsonicus*, *S. h. loquax* and *S. h. baileyi*; the tail is thus very different from *S. h. richardsonii*; lower surface of tail gray, grizzled sparingly with black.

Summer pelage. Above nearly uniform dark olivaceous, with the sides of the shoulders and outer edge of thighs suffused with strong reddish fulvous; upper surface of feet ochraceous; the dusky lateral line as a rule, narrow and rather indistinct as compared with most other members of the *S. hudsonicus* group; tail above without a well defined central area of reddish (owing to the hairs being narrowly but profusely ringed with black) bordered with a zone of black of the usual extent, and broadly fringed with fulvous, with the dark outer border and fulvous fringe as above. Type taken at South Pass City, Wyoming. Geographical range, Wind River Mountains Region, and northward along the eastern base of the Rocky Mountains to at least Mystic Lake, and probably to the belt ranges east of Helena, and thence westward to the head of Snake River in Idaho and south along the Idaho and Wyoming boundary to the Wasatch Mountains in Northern Utah. Its range thus includes not only the Wind River and Gros Ventre Ranges, but the Shoshone and Beartooth Mountains, the whole of the National Yellowstone Park region, and the outlying regions east of the Main Divide to Central Montana, to the westward and southward it includes the Snake River, Cariboo, Thompson, Blackfoot, Bear River, Bannock and Wasatch Ranges, with their outlying and included or connected spurs. *Sciurus hudsonicus ventorum* finds its nearest ally in *S. h. baileyi* from which it differs in much darker and more olivaceous coloration above; the upper surface of the tail has the rufous of the central area more varied with black, and the under surface is grayer and less suffused with fulvous. The differences are not great, but are really appreciable and fairly constant. *S. h. ventorum* is thus one step nearer *S. h. richardsonii*, from which it differs strikingly in the less red and more oli-

vaceous upper parts, and in the greatly reduced amount of black in the tail. It doubtless intergrades with *richardsonii* at the northward, Mystic Lake specimens being fairly good intermediates, though much nearer *ventorum* than *richardsonii*.

(*To be continued in April Museum.*)

A Great Pelican Rookery.

BY C. F. HOLDER.

It has always been somewhat of a mystery where the numerous brown pelicans, so common on the Southern Californian coast, made their headquarters During the summer months these lumbering birds which bear so grotesque a resemblance to some of the old pictures of the dodo, come into the little bays alongshore and engage in a vigorous warfare upon the small fry—anchovies, herring, smelt and young mackerel—which are found there in such vast quantities.

The pelicans are very tame, and pursue their avocation within a few yards of vessels lying in the bays.

Their method of obtaining food is arduous in the extreme, and it is only by continual vigilance that they make a living. In hunting for food they fly heavily, twenty or thirty feet above the water, the long and slender bill, from which depends a capacious pouch, pointing downward, the small brown eyes on the watch for the expectant school of fish. Should it appear, the bird apparently throws itself over, then plunges downward, head first, with mandibles apart. The height of the dive in many instances carries the bird completely out of sight beneath the water, from which it rises in a few seconds, and is it has been so fortunate as to engulf a sardine or several in its capacious mouth, it tosses them up seemingly from the pouch, by throwing the bill aloft,, then swallows the morsels with self-congratulatory waggings of the diminutive tail, suggestive of its satisfaction.

The capture of game is not always a guarantee of a feast. The laughing gull, common in these waters, preys upon the pelican or robs it systematically whenever it can. This it accomplishes by alighting on the pelican's head or back as it rises, and as the clumsy bird attempts to arrange the morsel in its mouth preparatory to swallowing, the gull reclines forward and snatches it from between the long mandibles and flies away with exultant cries.

It has been supposed by many that the brown pelicans make their headquarters in Lower California, coming north in the spring; but during the past season, the writer, during a cruise among the islands off Santa Barbara County, found the rookery of these birds. The islands which constitute the group are divided into two series:—the Santa Catalina off Los Angeles County, lying according to the chart, in what is called the Santa Catalina Channel. These islands include San Clemente, Santa Catalina, San Nicolas and Santa Barbara. Seventy-five miles to the north lies a second division comprising Santa Cruz, Santa Rosa, San Miguel and Anacapa. The latter is a long, slender, rocky island, rising from the water's edge to a mesa between one and two hundred feet in height at the east end. The highest portion recalled the famous enchanted mesa, as it was evidently inacessible except by using ropes and a kite.

The island is divided into three distinct portions by the sea. The extreme end is flat, terminating in a pinnacle of rock, while through the center is a lofty arch, high and broad enough to admit the passage of a large yacht, through which the sea runs. The mesa was covered with birds, and as we run near and fired the yacht's cannon there arose a cloud so vast that it fairly colored the air. Every bird had a long bill, and it suddenly dawned upon us that here was the home of the brown pelican on the Southern California coast. The great ledge of rock, flat on top, was colored

white by the guano of the birds, and was distinguishable five or six miles distant. As we approached the side of the cliff, which formed a slight angle, was seen to be covered with pelicans, waddling with bills partly open and wings expanded. As the sound of the gun reached them the very ground seemed to rise, the birds whirling slowly upward in great circles, then slowly settling again.

The rookery, isolated and inaccessible, occupied probably four or five acres, where the birds seemed to be packed in; and that it was an ancient one there was every reason to believe. Here, in all probability, the young are reared in May. At the time of our visit, the middle of August, the rookery appeared to be occupied by old birds and two-thirds grown birds.

The pelicans here nest on the ground, there being no trees of any kind on this wind-swept island This is in direct contrast to the brown pelican of the Florida keys, at least in instances observed by the writer, where the nests were in mangrove trees which were growing almost in the water. The nests were of the crudest description, the eggs retaining their position by virtue of good luck.

Not ten miles from the pelican rookery of Anacapa was seen a series of remarkable caves in the entrance of one of which was a shag rookery. This was discovered by the aid of the odor some distance off. Upon approaching a remarkable overhanging cliff was seen, the summit of which was possibly 500 feet above the water—a stupendous pile of rock. Near the base it had been eaten away by the sea, leaving a series of rough shelves or ledges which were occupied by shags old and young.

Leading directly into the cliff was a large cave, whose side entrance was also pre-emptied by shags, who were, in the main, two-thirds grown.

After some difficulty, the writer landed and climbed into the rookery. The nests were of kelp and other sea weed roughly thrown together and strewn about on the rocks were numbers of young birds, some nearly devoured and others partly torn in pieces, showing that some animal preyed upon them. After a careful examination of the surroundings, the writer was forced to think that, half starved, the birds had preyed upon each other and that it was a literal case of the survival of the fittest On the water in the cave floated numbers of dead young shags which had evidently fallen in, and unable to swim, had been drowned. Yet the young handled were strong and powerful and used their sharp beaks to good advantage.

In the same cave an attractive swallow with white marking was nesting, its nest being fastened to the walls. They were made almost entirely of the feathers of sea birds, covered on the outside with a light clay veneer, which made them very heavy and also almost indistinguishable from the rock, this probably being the object of the birds —an interesting instance of protective resemblance. The pelicans undoubtedly use the Anacapa rookery as a nesting place, spreading from there up and down the coast to visit the various feeding grounds.

The great arch at Anacapa is of itself a notable object and well worthy a visit, being of large size and presenting a grand and picturesque appearance from either side. It well illustrates the manner of disintegrading which is going on in these islands, which are all honeycombed in the most remarkable manner, presenting a series of marine caves, which for size and interest have no counterpart in this country.

The east point of Anacapa, or the pelican rookery, originally had four arches where now there is one. These gradually were worn away until the top fell in, divorcing the section from the island, but preserving the mesa line or angle exact.

Notes on Helix Memoralis, Linne and Helix Hortensis, Mueller.

BY THE REV. J. W. HORSLEY, M.A.

It was disgust that me a student of snails. Not the affected disgust of a young woman when she discovers a beautiful and interesting specimen of *Arion ater* upon the rose she has unnecessarily plucked; but the disgust at myself, a naturalist by heredity and by environment and education from my earliest years, when I found by the inspection of a collection of British land shells made by a young friend that I had poked about hedges and ditches, woods and cliffs, for thirty out of the forty years I had lived, and yet had never noticed shells so striking in color and variation as *Helix nemoralis*. I set to work at once to remedy this defect in my character as a general observer of nature, and at first collected only *nemoralis* and *hortensis*. Soon, however, this led me to help the collections of others and to form one for myself by gathering all the British land and fresh-water molluscs. And then I cast my eyes abroad that I might better learn how to see at home, and laid the foundation of what is now a fairly large collection of the Helicidae of the world. The path that proved so pleasant to me is one on which I have induced the feet of not a few lads and men to tread, and with beginners I have always directed their attention first to these two *Helices*, so striking and so common. To display my collection of the varieties and variations of *nemoralis* and *hortensis* is always to excite astonishment, and frequently to incite people to do and to possess likewise. A few notes, therefore, on these allied shells may be of interest to those who have not directed any special attention to their peculiarities.

First, let me utter a British growl, a grammarian's grumble, anent the absurdity or the misleading character of some of the scientific names we must encounter. *Helix nemoralis*, the snail of the groves, need never be pursued in the grove when there is a hedge handy, and especially is it abundant on sand-hills by the sea, which are about as diverse from groves as anything can be. When the broken shells of *nemoralis* are found in a wood, it may generally be discovered that they have been brought in from outside by some thrush, and that few living specimens can be found in the wood itself, except where they have entered beech woods for the purpose, so dear to them at certain times of the year, of ascending the smooth boles of the beech. Such *nemora nemoralis* are, according to my observation, usually of the nature of copses or plantations, and the deeper the wood the less the chance of finding *nemoralis* therein. Nor is the accuracy of the term *Helix hortensis*, the garden snail, much greater. I can only recall one garden, at Trentham, in which I have found it abundantly.

The hedge-row snail would be a better name, and *H. aspersa* might by the general acclamation and execration of all gardeners become the real *hortensis*. Nor are one's growls hushed when some of the varietal names are noted. Who was the maniac who called first the yellow bandless variety of *nemoralis*, *libellula*? The word is as unknown to classical Latin, as classical Latin is usually unknown to those who libel and ill-treat specimens by the so-called scientific names they give them. There is, indeed, *libella*, which means an as, two-thirds of the truth concerning the sponsor of the shell. In the Latin of Natural History, however, *Libellula* means but a dragon fly. Were the dragon-flies which the author of the name had seen, uniformly bright yellow? Or did he find in their strongly reticulated wings, their enormous eyes, their powerful flight, and their carnivorous habits, the points of similarity to the shell which caused him to make the names identical? Then the red unicolorous and unbanded variety is called *rubella*. This in somewhat late Latin means reddish, but why is *rubra* not used? Its hue is

definite enough,* and needs no term implying qualification or indecision. And the corresponding variety in *hortensis* is *incarnata*. To classical Latin this word is unknown: in mediaeval Latin it would, of course, be common, as meaning having become flesh. What was running in the namer's substitute for a mind was apparently the idea of flesh-colored, and the fancy that *incarnatus* referred to a tint, and not an operation or a state. From cherry-red to pink, grade the hues of both *rubella* and *incarnata*, and *rubra* would exactly and acurately describe both. And then the yellow grounded, transparent banded variety of *hortensis* is, if you please, called *arenicola*, or the denizen of the sands! For myself, I have never found *hortensis* of any variety on one of the sand-hills I have searched, and I never found any one who could guess why this name was supposed to be appropriate. I did indeed once find on the Deal dunes or Sandwich sand-hills one or two of the corresponding variety of *nemoralis*—i.e., *hyalozonata*; and as this was (like all the forms of *nemoralis* I have seen that have no pigment-producing power for their bands) not black-lipped, I might, if unobservant and foolish enough, have taken it for *hortensis*, and have called it *arenicola*, though dozens of other varieties abounded in the same position, and would be equally entitled to the name. I suppose the namer of *arenicola* has long become *humicola*, and we cannot interrogate him as to what he might be pleased to call his reason for giving this name. Peace, therefore, to his ashes!

Is it really impossible for British conchologists to determine on the common adoption of an intelligible nomenclature, and, considering how undoubtedly allied are the two species, *nemoralis* and *hortensis*, to adopt the term *lutea* for what is called *libellula* in one and *lutea* in the other; *rubra* for what is *rubella* in one and *incarnata* in the other; and *hyalozonata* for the *hyalozonata* of *nemoralis* and the *arenicola* of *hortensis*?†

I pass on to give a few notes on the differences between *nemoralis* and *hortensis*, which, by the consent of the majority of conchologists, are distinct species, although M. Souverbie, Curator of the Bordeaux Museum, waxed very vehement when discussing the matter with me, and maintained they were only varieties.

Others, in earlier days, maintained that the two species were so allied that there was a hybrid form, which form we should now call simply *H. hortensis* var. *fuscolabiata*. I have never seen *nemoralis* and *hortensis* pairing, although I have carefully looked out for instances, nor have I met any one who has This is a strong argument for their diversity, although an occasional paring would not prove them to be the same species.

The second difference is an anatomical one, the obvious and unvarying difference between the darts of the two species. That of *nemoralis* is straight and very like the Roman short sword; that of *hortensis* is curved. The length of the dart in *nemoralis* is 7-8 mm.; that of *hortensis* only 4 mm. The observation of the dart is of especial value when a form is found with white peristome and transparent bands associated with undoubted *nemoralis*. Is it a stray *arenicola*? or is it the much rarer *hyalozonata* form of *nemoralis*? The shells tell you little; the darts leave you no doubt. In fact, as *nemoralis* var. *albolabiata* is so rare in most places, it is always well to verify it by an examination of the dart.

* Does not this, like all of the color variations dignified with the mis-applied title of varieties, shade into its fellows, and may not this be the real reason of the qualifying name?—Ed.

† Or perhaps if the suggestion made by Mr. B. B. Woodward in "The Zoölogist" (Nov., 1885, "On some variations in *Helix arbustorum*, Linn."), of simply using the "terms, yellow, red or white variations" and phrases such as, "with transparent bands," and so on, in conjunction with the band formulae, was followed, the difficulty would be met.—Ed.

The size of the two shells varies—*nemoralis* is usually 16½ millimeters in height and 22½ in breadth, and *hortensis* 16 mm. in height and 18 mm. in breadth, and generally the former is more variable in size than the latter. My largest *nemoralis* is 32 mm. in breadth, and my smallest *hortensis* 11 mm. The difference I have especially noticed abroad, where *nemoralis* is often much larger than the average size in England, but *hortensis* remains the same. A third point to be noticed is that it is not usual, though by no means unknown, for the two species to be found in the same habitat. I can only say, in mentally reviewing the very many localities in which I have noticed or gathered thousands of these shells, that I can recollect a hedge here and a bank there where both were found mixed and in fairly equal proportions. Even here both are found in the same lane, one may be exclusively found at one end and the other at the other. It seems to me, also, that *nemoralis* is more dependent than its cousin, or *hortensis* less dependent than *nemoralis*, on a calcareous soil. And in a district where both are found *nemoralis* will affect the parts where the chalk or limestone comes to the surface, and *hortensis* will be in the hedges of the valley where alluvial soil to some extent covers the calcareous rock. Have conchologists noticed, by-the-by, that in many places both these shells are common in wayside hedges and on the sides of high roads, but far less common in hedges a field or so distant from the road? One might have thought that the less amount of cover and the greater amount of enemies to be found close to the roads in comparison with field hedges would have reversed the position of affairs. But it seems to me that the dust of the high road provides lime so conveniently comminuted for the building up of their shells that they have been drawn, so to speak, into public life by its advantages.

Both shells being in their typical form five-banded, one may notice that the bandless or unicolorous varieties are much more common in *hortensis* than in *nemoralis*, one observer finding that 52.52 of the *hortensis* and only 17.86 of the *nemoralis* he collected in one district in Middlesex were of the bandless kind. This one might expect from the fact that *hortensis* is, on the whole, feebler than its cousin, and so more likely to be without pigment-producing powers, and this is born out by the rarity of the translucent-banded forms in *nemoralis* and their comparative frequency in *hortensis*; and also by the variety with only a peripheral band being quite common in *nemoralis*, but distinctly rare in *hortensis*. But one must note *per contra*, and contrary to one's expectation, that the variety (sometimes called *coalita*) in which form excess of pigment power all the bands are united into one broad belt of chocolate color that occupies nearly the whole whorl, is much more common in the weaker *hortensis* than in the sturdy *nemoralis*.

Other differences are these: The albino form is not uncommon in *hortensis*, though one may notice that the dead white appearance of the shell gives way to a white tinged with yellow when the animal is extracted; but in *nemoralis* there is hardly a really albino form, the name var. *pallida* being more justified than that of var. *albina*. The variety *lilacina*, again—a tint, by-the-bye, very rare in other Helicidae—is doubtfully found in *nemoralis*, though abundant in certain localities for *hortensis*. Nor are the two species at all alike as to unicolorous specimens of a brown color. In *nemoralis* we have the vars. *castanea* and *olivacea*, not rare and giving us many shades, from a dark ruddy brown to a light yellowish brown; but in *hortensis* the corresponding var. *fusca* is rare, and there is nothing like the series of shades of brown to be found.

Another point of difference is the prevalent ground color. Looking at

nemoralis in quantity, and including both banded and unbanded varieties, one would certainly come to the conclusion that the original type was red, whereas in *hortensis* yellow is the prevailing color. The percentages of *nemoralis* were found by Mr. Belt, of Ealing, to be, at any rate for his neighborhood, 37 per cent. yellow, 51 red, and 12 brown; while those of *hortensis* from the same district were 86 per cent. yellow, 14 red, and 0 brown.

Another point of difference seems to be that the color of the peristome and columella is normal in *nemoralis* and accidental in *hortensis*, and collectors will notice that it is much more fugitive in *hortensis* than in *nemoralis*, so that the varieties of the latter shell with dark red, pink, or yellow lips should be protected from the light, and even then may be found to lose the color of their peristome.

No doubt some of these differences are not of very conclusive force when used singly as arguments for the species being only allied and not one, but the cumulative force they possess when considered all together is by no means small.

Nemoralis is probably the older shell of the two, being found not only sub-fossil, but actually in Miocene strata, while I am not aware that a similar antiquity can be claimed for *hortensis*. It might, therefore, be held that *hortensis* is but a weak offshoot from *nemoralis*, or a more northern form. My own observations, however, in Central and Southern France and in Switzerland would not lead me to this conclusion.

Unlimited Supply of Fossil Remains in the Bad Lands.

Professor O. C. Farrington, of Chicago, who spent last summer with his assistants in the Bad Lands of South Dakota, Nebraska and Wyoming, writes in his report as follows:

"No region in the world is richer in the remains of ancient mammals than that mentioned, and the work of collecting and preserving them before they decay seems of paramount importance. Aside from the intrinsic interest which the structure of these ancient animals possess, it seems hardly less than a duty on the part of the museum to secure and preserve as far as possible these remains, as often as they are exposed by the hand of nature. The expedition sent by the museum this year devoted its attention mainly to collecting mammal remains of the White river and Loup Fork ages I was ably assisted in the work of collecting by Mr. E. S. Riggs, and about three months were spent by the party in the field. The work was conducted during the first seven weeks in the Bad Lands of South Dakota, after which the "Corkscrew" beds near Harrison, Nebraska, were visited. The party then explored the escarpments of the Deep River beds near White Sulphur Springs, Montana, and the remainder of the time available was spent in the Hat Creek basin of Wyoming. While the material is as yet too largely in the matrix to be accurately reported upon, the expedition may be characterized as remarkably successful. The amount and quality of the material collected are such as to amply repay for the outlay, and it was clearly demonstrated that the material could be secured by collection in the field far more profitably than by purchase. The quantity of material obtained for a given outlay was larger. The work of collection was directed towards a needed kind of material, and details of scientific value were noted which could not be gained with a purchased collection. Among the specimens secured were a nearly complete skeleton of Titanotherium, a large skull, with jaws and thirteen vertebræ, three skulls and many miscellaneous bones of animals of the same genus; two skulls, jaws, and leg bones of Aceratherium; a probably complete skeleton of Poebrotherium; a skull of Protoceras; twenty-five skulls, some with

jaws, and leg bones, of Leptauchenia, and about twenty-five skulls each of species of Eporeodon and Oreodon; a skull, jaws, vertebræ, and leg bones of Cynodesmus; skulls and miscellaneous bones of Hyracodon, Mesohippus, Hyaenodon, Daphaenus, and Leptomeryx, and representative bones of three genera of rodents. These specimens will be cleaned and mounted during the winter months, and from them it will soon be possible to make a creditable exhibit, as a beginning of a collection of ancient vertebrates."

Correct Names of Seeds and Nuts.

While visiting the Agassiz museum recently at Harvard college we copied a few names of Seeds and Nuts that are frequently seen in the "curio" draw of collectors.

Following is the list from our note book:

Hura crepitans, cracking nut, from Central and South America.

Abrus precatorius, Black-eyed Susans, from the West Indies.

Trapa bicornis, Chinese Horn Nut from China.

Entada scandens, Liver Bean from Florida.

Nelumbo lutea, Water Chinquapin from Bahamas.

Cocos nucifer, Cocoanut from Ceylon.

Quercus macrocarpa, Burr Oak Seed, Missouri.

Ceratonia siliqua, St. John Bread, from Egypt.

Rhus typhina, called Staghorn Sumac.

Saplindus marginatus, a curious Red Berry or Seed found at Shannondale, Ind.

Selaginella pringlei, Resurrection Plant from Mexico.

Tectona grandis, Teak Nut from India.

Tecoma radicans, Trumpet Flower Pod.

Phytelephas macrocarpa, Vegetable Ivory Nut, South America.

Maclura aurantiaca, Osage Orange Ball, U S.

Lecythes Seeds, called Paradise Nuts.

Adansonia digitata, a curious round nut from West Indies.

Pornciana pulcherrima, Ponciana Pod from West Indies.

Entada gigantea, curious Pod from Antilles.

If any of our subscribers have the names of the Brown Banded Sea Bean also Red and Black varieties, etc. we should be pleased to have them.

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VOL. V ALBION, N. Y., APRIL 15, 1899 No. 6

THE MUSEUM.

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The Gulls and Terns of Sagadahoc County, Maine.

The most favorable time for observing individual characteristics of many of the birds which inhabit our sea coast, says Mr. H. L. Spinney in the *Journal of the Maine Ornithological Society*, is during the severe storms which visit it in late fall, winter and early spring. It is then, when man with all the reason and ingenuity at his command is helpless to conquer the storm, that these smaller representatives of the animal kingdom are to be seen forcing their way against the wind, apparently with little exertion, or riding on the crest of the fiercest waves with perfect security.

In the morning as soon as it is light enough to see, we will repair to some promontory which presents its side to the storm. If it divides two large bays we shall get the best results, as the birds flying across the leeward bay with the wind quartering ahead gradually make leeway and to double the headland must fly for a longer or shorter distance parallel with the shore, thus bringing them within range of the collector and allowing him to secure many species, which without these circumstances, it would be almost impossible to do. The wind blowing a gale, interspersed with rain squalls, and the dull crash of the sea as it breaks in all its fury on the rock-bound shore, fills us with awe at the power of these elements As we peer through the mist from the breakers, our attention is attracted to a bird, which, with slow strokes of the wings, slowly approaches, following the shore, now rising in air and again with motionless wings gliding with rapidity into the hollow of the sea, rising just in time to avoid the crest of the wave which breaks, leaving a track of white foam behind.

We at once recognize this bird to be the Herring Gull (Larus argentatus smithsonianus). How easily it breasts the gale, now with motionless wings, then suddenly swooping down to the crest of a wave to secure some marine object which is brought to the surface. So easily is this done that we think these environments must be necessary for its existence.

Sometimes it will hover over some submerged ledge, where amid the seething foam, its quick eye detects some fish or crustacean which has become disabled by the sea. At this time perhaps no other gull may be seen, but should the one mentioned

meet with success, before we are aware of it the air is full of them, their shrill notes penetrating the din of the storm, and woe to the one that is lucky enough to secure some eatable object, for if it cannot swallow its food at once it is chased by the others until it eludes its pursuers or is compelled to drop it, when some other gull quickly secures it, while the original owner commences searching for more. Should they not find any more food at this particular place, they quickly disperse, only to repeat the same manœuvres when some other fortunate bird attracts their attention, and in this manner they will follow the shore hour after hour, seemingly tireless.

Again our attention is attracted to the Black-backed Gull. This species is much larger than the preceding, and while the Herring Gull may be seen every day in large numbers, the Black-back is seldom seen near the shore, except during the most severe storms, and then I do not think the ratio would exceed one to three hundred of the former. The reason for this is that it is more pelagic than the Herring Gull and unless it is driven in by storms, few are seen.

How gracefully it moves along, as with slow and steady strokes of the wings it moves against the wind, gradually rising in air until a certain height is gained, when with motionless wings it glides off, quartering from the wind, on a downward angle with the speed of an arrow, until when about to strike the crest of a wave, it suddenly mounts upward with great rapidity, bringing itself head to the wind and forging ahead and upwards until the desired height is reached, when it again repeats the same undulating movement. Should it see any food floating on the water, with a few graceful motions of its wings it at once stops its speed and returning, alights near the object, stops for a moment, then resumes its flight. Sometimes when the storm is abating and the sun for a moment shines out through the hurrying masses of dark clouds, then is the Black-back seen at its best; the light shining on the pure white under parts in contrast with the dark slate of the back and upper parts of wings, making it appear the most beautiful of our pelagic species

During severe storms large bivalves such as *Cyprina islandica* and the Beach Clam (*Hemimactra solidissima*) are washed upon the beaches. Then these species, especially the Herring Gull, resort to such feeding grounds. As the valves of the clams are too thick and strong to be broken by their bills, they will take one and rising some fifty or more yards in the air, drop it so it will strike on the hard sand, repeating this manæuvre until the shell is broken, when they will alight on the beach and extract the contents to their own satisfaction. Again, one or more of the Herring Gulls may be seen associating with a flock of ducks, sometimes sitting on the water with them, at others, hovering in air over them, waiting for one to appear at the surface with some choice morsel it has procured at the bottom. As soon as the duck reaches the surface and before it has time to swallow its food, the gull will snatch it and fly a few yards, alight on the water and eat what it has stolen, returning for more as soon as it has disposed of what it already had. Sometimes the duck will elude the gull by quickly diving, reappearing a few yards away, and succeed in swallowing its food before the gull can get it. Although it has the appearance of an overbearing thief, yet it recompenses the ducks by its alertness for any danger, it being almost impossible for any object to get near without it giving an alarm. It would seem that the ducks realized the protection of the gull, since they permit it to rob them without opposition and allow it to still associate with them.

I remember an incident of the watchfulness of a Herring Gull which was very distasteful to me. At the

time it happened I lived a mile from a small river which was a great resort of river ducks. Being at leisure that winter, I visited this river nearly every day for three months, after birds. During severe cold the river would freeze over, except one place about half an acre in extent, where the current was very swift. This opening at a certain time of tide, was a favorite resort of some forty or fifty ducks (*Merganser americanus*) to fish for smelts. Every day for two weeks I tried to shoot some of them, but owing to the alertness of a Herring Gull which invariably accompanied them, I did not succeed in getting any, as the gull would always see me and give the alarm, when the Mergansers would fly away. Had it not been for the gull, I could have got near them without any trouble, and although this gull was a very beautiful specimen of the species, I never could appreciate it.

In the same environment of which I have read, we notice another species. There may be three individuals or perhaps fifty, flying in a straggling flock with rapid strokes of the wings, just high enough to avoid the crest of the waves. This is Bonaparte's Gull, one of the smallest of our species. As it flies along, there is no regularity to its movements. It darts here and there as some floating object attracts it attention, and if it be anything it wants, it hovers over it in mid air and daintily touching its feet on the water picks up the food and at once commences looking for more, returning to interview some other gull, which lags behind, all the time acting as if it enjoyed the storm as a huge joke. This gull enters our estuaries about the 20th of November and may be seen in such places until the middle of December, when they quickly disappear, one seldom being seen during mid-winter.

The Kittiwake Gull, larger than the preceding, has much the same habits except that it rarely enters the rivers. While the Herring and Black-backed Gulls may be shot from blinds on the shore, Bonaparte's or the Kittiwake will seldom come within range, unless decoyed. This is easily done, especially from a boat, by waving a white cloth or tossing some small object on the water which will splash. As soon as one is killed or wounded, the others will hover over it until nearly if not all of them have been killed, and this is also characteristic of the terns. The collector hunting them for millinery purposes was not long in realizing this fact, and many colonies of these beautiful birds were nearly exterminated to satisfy the barbarism of modern fashion.

To observe the terns we must repair to the locality of some rocky islet where they resort to breed during June, July and August. Twenty years ago a colony of Common and Arctic Terns, which perhaps numbered three hundred birds, bred on the Heron Islands off Popham Beach, also some fifty on the Black Rocks in Sheepscot Bay. Owing to the persecution of the summer sportsman and the fisherman, these colonies have gradually grown less each succeeding year, and I am sorry to say, for the past two years, not a bird to my knowledge has bred at either place. Although seventy years ago they bred in abundance on the coast of Sagadahoc County, I think I can positively state that not one individual has been hatched in this county for the past two years. As we row along the beaches the last of June, the warm sunshine gleaming on the water, with occasionally a warm wave of air from off the land, impregnated with the perfume of summer foliage, we are aroused from our languor by the sharp cry of one or more birds. Looking up we at once recognize the Common and Arctic Terns. We also notice that instead of the bill being carried horizontally with the body, as it is with the gulls, it is nearly perpendicular, and also that the wings are longer and more pointed in proportion to the body, than with the gulls. Moving along a hundred or more feet

in air with quick strokes of the wings, it detects a small fish near the surface. Poising itself with a quick fluttering of its wings, it darts down like an arrow and disappears beneath the surface, reappearing in a moment, if successful holding the fish with the tip of its bill, it rises quickly in air, and giving itself a quick, vigorous shake, moves off swallowing its food as it flys. Sometimes it carries the fish to its young on some small islet in the vicinity, at others it is chased by other terns until it either eludes them or surrenders its food. They are very solicitous for their young and in their rage will often strike one's head when on their breeding grounds.

They can be readily tamed if taken when young and will not leave when given liberty, but will follow around like a tame crow. They are always dependent on their captor for food, never seeming to learn to capture it for themselves as they do when reared by the parent bird, nor do they learn to oil their feathers, but will stay in the water and drown like a shore bird, if not taken out. This is my own experience.

Of the Caspian Tern I can say but little. It seems to be more pelagic than the others as I have seen it but twice since 1884. The last of August of that year I was walking across Sagadahoc Bay in Georgetown, Me., when my attention was attracted to five birds sitting on the sand near the middle of the bay, it being low tide. I thought them gulls and paid but little attention to them. I had a small dog with me which was running along some distance in advance. All at once I heard a squawking and my dog came running towards me, the five birds pursuing and uttering their harsh cries. Before they were aware to whom they were being introduced, I had three of them lying dead on the sand. Two of these were in full adult plumage, the third a young of the year. In the adult plumage, this beautiful tern is at once recognized by its large size, stout orange red bill and black crown and back of neck. Also by its harsh voice which gives it the name of "Squawker" by the fishermen.

In August, 1893, I saw this species last, three specimens passing Seguin Island. I would say in closing, that although I have not yet seen the Glaucous Gull to recognize it, I anticipate adding it to the gulls and terns of Sagadahoc County in the near future.

NOTES.

The Collecting Season.

With this number the collecting season fairly opens in most of the Northern States. The ornithologist begins to take records of the birds on their spring migration The oologist is eagerly scanning the old hawk nests in his vicinity to see if any owl feathers are adhering to the edges, thereby showing signs of occupancy. The taxidermist is busy with the "wonderful" birds that are brought in by the farmers, to be stuffed The entomologist is eagerly scanning trees, fences and out-of-the-way places for cocoons and other signs of minute animal life that will spring into existance as old Sol creeps higher to the northern sky. The botanist is watching with pleasure the prospect of a large crop of ferns and other handsome plants that will yield up life and in a large measure beauty for the aid of science and recreation. And last, but not least of all, the conchologist is eagerly prodding and searching the small creeks, streams, canals, etc., for molluscan life that he is sure to find there as soon as the ice breaks away.

All this applies very nicely to our northern and central area in March and April but if we step down and visit our southern brothers in Florida, Texas, New Mexico, and so on during these cold spring months we see quite a different scene. They were carefully looking up their "outfit" long in December. In January they were watching the various forms of animal

life start up "housekeeping" for the summer of '99, and in February the oologist was in Texas for instance carefully lifting out sets of Caracara, Turkey Vulture, and other nice things and even now is making daily finds that would set a northern oologest half crazy. The ornithologist who wishes to fill his cabinet with fine skins could nowhere in the United States find a finer field for shooting than from Galveston to the Mexican border from February 1st to April 1st. The variety and countless thousands of bird life in the numerous bays that indent South Texas is absolutely beyond description.

Our California brethern are also hustling these days and already are making records among the birds. One of our lady subscribers writes of spending two weeks along the beaches in Southern California in February, with a summer dress and sun bonnet on seeking pretty shells at the low tide, while ye editor was hustling buckets of coal into various stoves to keep the winter blasts 10° below zero from freezing us entirely. Even now as the spring breezes begin to blow occasionally and only the other day we saw a robin sunning himself on the lawn as our postman hands us a letter from one of our Monitaba subscribers where he tells us of the 20 and 30° below zero that still prevails around his little home.

Thus we see the MUSEUM reaches a great variety of climates and a great variety of collectors on its monthly visits. We wish we might more forcibly impress on every subscriber the value of putting his brief notes of collecting, trips, finds, and so on, in print.

Our Monitaba friend for instance has possibly always lived there and it seems like an old story to him and he thinks it would not interest others.

Our California friends think the same, our Texas friends likewise, and our New Brunswick, Nova Scotian and even Prince Edward Island friends think nothing they could write would be of special interest, but let me pick 6 to 10 of you and place you around a warm fire and set you to visiting, and the chances are you would see no sleep that night.

We can speak from experience, viz: Not such a very long time ago we were to ride all night in a sleeper. Met a Honolula man and visited right through to daylight, hardly thinking of the sleeper ticket in my pocket. I could repeat a hundred instances of a somewhat similar nature.

Now we shall likely not ever meet all of our subscribers and "talk it over," but let us hear from you through the MUSEUM. It will interest us, it will permanently put your notes on record and will interest over 1,000 other collectors all over this vast country and many collectors in foreign lands.

I am going to conclude this "after breakfast reminescence" with a true story that occurred last summer in our adjoining county on the west. The family is well known to me from early boyhood, and what I relate was seen myself. Their little son of 12 years, somewhat of a naturalist, possessed a cat with 4 kittens only a few days old. They had a sufficient stock of cats and really wanted to get rid of the kittens. One day as they were a week or so old, the boy with his dog dug out a woodchuck *Arctomys monax* and there found a nest of little ones, 2 of which he brought to the house and substituted for 2 kittens. The cat evidently liked the new comers all right and to all appearances "didn't know the difference." A day or 2 later the boy was chopping up a dead and rotten apple tree and splitting open the tree found a nest of little red squirrels, *Sciurus hudsonius* which were very young, scarcely having any fur. He took one of these and substituted for another kitten, which the cat also took into the family apparently with good grace. We had heard of this circumstance and passing by the place one day early last summer we stopped and

had the rare good fortune to witness the mother cat nursing—one kitten, two young woodchucks and one young red squirrel.

Have any of our subscribers seen a more singular occurrence?

W. F. W.

Cave Love.

GLEANINGS FROM A RECENT REPORT OF THE U. S. GEOLOGICAL SURVEY PREPARED FOR THE QUARTERLY BULLETIN OF THE SOCIETE DE SPELEOLOGIE, PARIS, BY PERCY VAN EPPS.

A handsome volume just issued by the United States Geological Survey (Part II of the 18th annual report) has several articles containing items of much interest to lovers of the science of speleology.

The second paper in the volume is by R. T. Hill and T. W. Vaughn, and is entitled, "Geology of the Edwards Plateau, and Rio Grande Plain adjacent to Austin and San Antonio, Texas, with reference to underground waters." Many fine full page plates accompany this paper. Two of these illustrate cavern exteriors and a third gives a beautiful view of the interior of Hillcoat cave, Edwards county, Texas.

Messrs. Hill and Vaughn speak as follows of the caverns of the Edwards Plateau, pp. 209-210: "There are many interesting caverns in the Edwards Plateau, and inasmuch as their occurrence, together with the general question of limestone solution has great bearing upon the distribution of underground water, it is essential that they be briefly mentioned. They are of three general types: (1) Small cavities within individual limestone strata, giving them what is usually termed a honeycombed structure; (2) open caverns occurring in certain bluff faces along the stream valleys; (3) underground caverns of vast extent dissolved out of many strata. One of the latter class occurs in Edwards county, and may be taken as a type. It is situated just west of the McKenzie trail, about six miles northwest of Hillcoat's ranch. The entrance is near the summit of an oval, conical butte. The recesses apparently undermining the whole of the hill, are elongated chambers having cross sections shaped like Norman arches. The total depth from the entrance to the bottom, as far as explored by the writers, is over 140 feet. The many chambers are lined with stalactites and stalagmites of great beauty and variety of form, and they are nearly dry, only a little water being found at the lowest depths. The method of rock solution here shown is especially interesting to students of underground water, as it gives an insight into the related problems discussed in later pages of this paper. Other caverns of a similar nature exist in nearly all the countreis embraced within the area of the plateau, especially in Hays, Blanco, Medina and Bexar counties.

Another interesting paper in this noble volume is by G. K. Gilbert "Recent Earth Movements in the Great Lake Region." Measurements of the water level of the lakes, Superior, Michigan, Huron, Erie and Ontario, through a course of years tend to show quite indubitably that a slow tilting of the entire region is taking place—that the whole lake region is being slowly tilted towards the southward.

Vast consequences to man may result in future time if this oroganic movement be continued. Niagara Falls will run dry. Unless a dam be erected to prevent, the waters of Lake Michigan will eventually find their way to the Gulf of Mexico by the medium of the Mississippi river, the Illinois river and an existing channel carved by the outlet of a glacial lake of Pleistocene time. The summit of the channel is now but eight feet above the mean level of the lake. Gilbert says, (page 640): "Evidently the first water to overflow will be that of some high stage of the lake, and the discharge may at first be intermittent. Such high water discharges will occur in 500 or 600 years.

For the mean lake stage such discharge will begin in about 1,006 years, and after 1,500 there will be no interruption. In about 2;000 years the Illinois river and the Niagara will carry equal portions of the surplus water of the Great Lakes. In 2,560 years the discharge of the Niagara will be intermittent, falling at low stages of the lake, and in 3,500 years there will be no Niagara The basin of Lake Erie will then be tributary to Lake Huron, the current being reversed in the Detroit and St. Clair channels.

The subject is intensely interesting and is well handled by Professor Gilbert. Speleological research adds its testimony to the fact of this movement of mother earth. Certain islands near the south shore of Lake Erie have caves opening at the water's edge, being now partly occupied with lake water. These caves were explored by E. L. Moseley, who finds in them stalactites extending from the roof down into the water, and stalagmites lying three or four feet below the present surface of the lake. "Comparing the present water level with the lowest levels known in recent times, it appears that these stalagmites have not been above water during the present century, and as stalagmites are found only in the air, it is clear that the lake has encroached on land since they were made."

A third paper relates to the glaciers of Mount Rainier. In this Israel C. Russell tells of a novel experience of his party in one of the snow filled craters on the summit of the mountain, for Rainiers, America's grandest mountain, was once an active volcano. Here, at an elevation of more than 14,000 feet. Russell and his party passed a night in a snow cavern. It was a strange and altogether uncanny situation.

At this enormous altitude, frozen on one side by the eternal cold of space, on the other scorched by the escaping residual heat of the primal molten globe. "The cavern we chose in which to pass the night, although irregular, was about 60 feet long by 40 wide, and had an arched ceiling some 20 feet high. The snow had been melted out from beneath, leaving a roof so thin that a diffused blue light prenetrated the chamber. The floor sloped steeply, and on the side toward the center of the crater there was a narrow space between the rocks and descending roof which led to unexplored depths. As a slide into this forbidden gulf would have been exceedingly uncomfortable, if not serious, our life line was stretched from crag to crag, so as to furnish a support and to allow us to walk back and forth during the night without chances of slipping. Three arched openings or doorways communicated with other chambers, and through these drafts of cold air were continually blowing. The icy air chilled the vapor rising from the warm rocks and filled the chamber with steam which took on grotesque forms in the uncertain, fading light. In the central part of the icy chamber was a pinnacle of rock, from the crevices of which steam was issuing with a low hissing sound. Some of the steam jets were too hot to be comfortable to the ungloved hand. In this uninviting chamber we passed the night. The muffled roar of the gale as it swept over the mountain could be heard in our retreat and made us thankful for the shelter the cavern afforded."

The floor of the cell was too uneven and too steeply inclined to admit of lying down. Throughout the night we leaned against the hot rocks or tramped wearily up and down holding the life line. Cold blasts from the branching ice chambers sweep over us. Our clothes were saturated with condensed steam, while one side of the body resting against the rocks, would be hot, the strong drafts of air with a freezing temperature chilled the other side.

After long hours of intense darkness the dome of snow above us became faintly illuminated, telling us that the sun was again shining.

The Anatinae of the Middle Missouri Valley.

I do not think that there is a place in the United States where a larger number of species of Ducks can be met with, than that portion of the Missouri Valley lying in Iowa and Nebraska.

During the last fifteen years I have recorded twenty species, all of them within twenty miles of Omaha. I have recorded the dates when seen and have a pretty good Duck record for this vicinity, which I present to those interested among the MUSEUM's readers.

Mallard, *Anas bochas*, LINN. The Greenhead as it is often called by sportsmen, is an abundant migrant and is not uncommon as a summer resident in the northern portions of Nebraska and Iowa. They arrive in spring, March 1st to April 20th; departing southward Sept. 20th to Nov. 10th. During mild winters large numbers stay along the Platte River all winter. Large numbers of these Ducks are killed along the Missouri, Niobrara, Platte, Elkhorn and Blue Rivers and the adjoining lakes, sloughs and swamps.

Black Duck, *Anas obscura*, GMEL. A common migrant, usually seen in company with the Mallard, arriving in spring and departing in fall about same time. Known to sportsmen as Black Mallard or Dusky Duck.

Gadwall, *Anas strepera*, LINN. A common migrant. Arrive March 20th to April 20th; returning southward in latter September and October.

Baldpate, *Anas Americana*, GMEL. An abundant migrant. This species is not usually seen in flocks but is commonly met with among Mallards or in pairs or trios. In autumn they frequent the corn and wheat fields and are sometimes seen upon the open prairie. This duck is almost always in good condition. They arrive in spring, March 16th to April 20th and return southward Sept. 15th to Nov. 10th. They are called Widgeon by many sportsmen.

Green-winged Teal, *Anas carolinensis*, GMEL. A common migrant; arriving March 20th to April 22d and in autumn during September and the first half of October. Large numbers of this species are killed by local sportsmen, notwithstanding their speedy flight.

Blue winged Teal, *Anas discors*, LINN. An abundant migrant and somewhat common as a summer resident and breeder. Arrives March 20th to May 1st. Breeds in latter part of June. (I found sets of 7, 9 and 11 eggs, incubation advanced, June 22d to 30, 1895 in northwestern Nebrsaka). Departs southward Sept. 15th to Oct. 20th Large numbers are killed by sportsmen and market hunters.

Cinnamon Teal, *Anas cyanoptera*, VIEILL. A rather rare migrant. A few are seen in the market among the other Teal. They are always among the Blue-winged Teal during migrations. A very fine male hybrid Cinnamon Blue-winged Teal was killed near here by a friend of mine. It showed markings of both *A. discors* and *A. cyanopera* and the crescent on the head is marked with brown The bird (mounted) is now in the U. S. National Museum.

Shoveller, *Spatula clypatea*, LINN. A common migrant and a few remain to breed in Iowa and Nebraska; arriving in spring, March 15th to April 10th, returning in fall, September 15th to October 30th. Breeds, June 1st to 20th. Known to local sportsmen as spoonbill. Easily decoyed and killed in large numbers.

Pintail, *Dafila acuta*, LINN. An abundant migrant. This is the first duck to arrive in spring, usually coming in with the early spring rains and sleet storms. They arrive in spring, February 12th to March 20th, returning in autumn, September 25th to November 1st. Locally known as Sprigtail or Sprigs. Easily decoyed and killed in immense numbers for sport and the market.

Wood Duck, *Aix sponsa*, LINN. A fairly common migrant and not rare as a summer resident in vicinity of timbered lakes and streams. Arrives in spring, March 25th to April 15th. Breeds in June and seen in pairs and trios all summer in small lakes and streams. They depart southward October 1st to 20th. Usually all gone before October 15th.

Redhead, *Aythya Americana*, EYT. An abundant migrant in spring but nearly as common in the autumn. Arrives usually in large flocks March 12th to May 10th. Latest seen in autumn Oct. 12. A few probably breed in northern Iowa and Nebraska. I saw several males in Lakes in N. W. Nebraska, June 24, 1895, the females were probably setting. Killed in large numbers for the table.

Canvasback, *Aythya valisneria*, WILS. An irregular migrant, abundant some years and quite scarce others. They will average up as a common migrant. A few breed in northern part of Nebraska. They arrive in spring, February 24th to April 20th, breeds June 1st to 30th and return southward September 20th to October 31st. Killed in large numbers by sportsmen and market pot hunters.

American Scaup Duck, *Aythya marila nearctica*, STEJN. A common migrant in spring, following shortly after the Baldpate, arriving March 20th to April 26th; returning in autumn, September 15th to November 10th. Known to local sportsmen as Bluebill and killed in large numbers.

Lesser Scaup Duck, *Aythya affinis*, EYT. An abundant migrant arriving in spring and autumn the same time as the American Scaup Duck.

Ring necked Duck, *Aythya collaris*, DONOV. Fairly common as a migrant arriving March 20th to April 25th, returning September 15th to November 1st.

American Golden-eye, *Glaucionetta clangula americana*, BONAP. Somewhat common as a migrant, arriving March 20th to May 15th. I have never observed this duck in autumn. They probably return southward early. Known to sportsmen as Whistlewings and Garrot and killed in considerable numbers along the Missouri River.

Barrow's Golden eye, *Glaucionetta islandica*,, GMEL. Somewhat rare as a migrant arriving in company with the American Golden-eye. I know of but one flock seen in autumn, some of which may have been American Golden-eye. I was present about ten minutes after a sportsman killed two males, September 10, 1897. It was from this that I surmised that the preceeding species returned early.

Bufflehead, *Charitnetta albeola*, LINN. Fairly common as a migrant arriving in spring March 15 to 30th and returning October 1st to 30th. Sportsmen call them Dumpling, Dumpy and Butterball.

Harlequin Duck, *Histrionicus histrionicus*, Linn. This beautiful little duck is a rare migrant. I know of three of this species being killed in this vicinity, two on the Missouri River, September 16, 1893 and one at Florence Lake, September 19, 1895.

Ruddy Duck, *Erismatura rubida*, WILS. An irregular migrant. This duck is the most irregular of all the ducks that visit this vicinity. Some years they are abundant and then for perhaps two years *none* are seen. They arrive late, May 1st to 20th and return October 1st to 15th.

ISADOR S. TROSTLER,
Omaha, Neb.

Size of a Spider's Thread.

Leewenbeck, the first microscopist, wrote in 1685 as follows: "I have often compared the size of the thread spun by full grown spiders with a hair of my beard. I placed the thickest part of the hair before the microscope, and, from the most accurate judgment I could form, more than a hundred of such threads placed side by side would

not equal one such hair. If, then, we suppose such a hair to be of a round form, it follows that 10,000 threads spun by the full grown spider when taken together will not be equal in substance to the size of a single hair. To this, if we add that 400 young spiders at the time when they begin to spin their webs, are not larger than one full grown one, and that each of these minute spiders possess the same organs as the larger ones, it follows that the exceeding small threads spun by these little creatures must be still 400 times slenderer, and consequently, that 4,000,000 of these minute spiders' threads cannot equal in substance the size of a single hair." —*Microscope.*

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VOL. V. NO. 7.

MAY, 1899.

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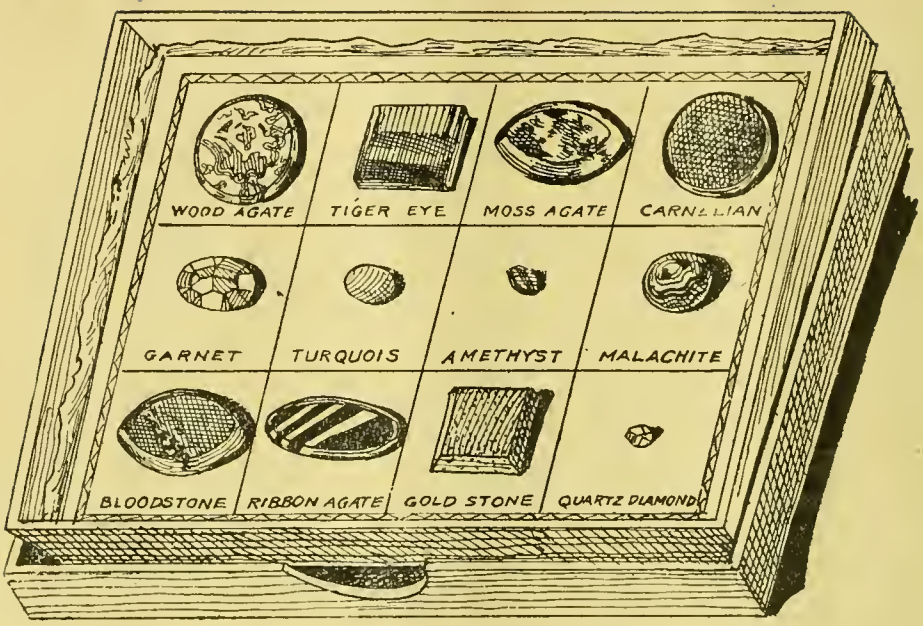

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THE MUSEUM.

A Monthly Magazine Devoted to Research in Natural Science.

VOL. V. ALBION, N. Y., MAY 15, 1899 No. 7

THE MUSEUM.

A Monthly Magazine devoted to Ornithology, Oology, Mollusca, Echinodermata, Mineralogy and Allied Sciences.

Walter F. Webb, Editor and Manager

Albion, N. Y.

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Revision of the Chickarees or North American Red Squirrels.

(Continued from March Number.)

Sciurus hudsonicus richardsonii (Bachman) RICHARDSON'S CHICKAREE. Winter Pelage. Above with a broad median band of chestnut rufous, the hairs finely annulated with black; rest of upper surface, including limbs and feet, brownish gray, the hairs ringed with pale fulvous and black, the general effect being a rather dark gray with a wash of fulvous; tail above with a narrow central area of dark rufous, more or less grizzled with black, and extending generally only about half the length of the tail; rest of the tail intense black, with a slight tinge of yellowish on the sides for about two-thirds of the length from the base; exceptionally extending all around the tail, including the tip; black lateral line generally prominent, sometimes more or less obscured; tail below yellowish gray centrally, the rest black or wholly black at the surface with the base of the hairs gray or grayish fulvous; below white, finely vermiculated with black, the dark plumbeous underfur showing more or less through the surface, giving a general effect (with the vermiculations) of grayish white; ears well tufted, the apical half blackish.

Summer pelage. Above nearly uniform rufous olivaceous, the hairs being ringed with fulvous or reddish fulvous and black; feet ochraceous to reddish orange, this color extending over the forearm to the sides of the shoulder, and generally over the hind limbs to the edge of the thigh; black lateral line strongly developed; ventral surface generally clear white, the plumbeous under-fur usually more or less tinging the surface; tail above with a narrow deep reddish central area, extending one-half to two-thirds the length of the tail, the hairs being basally yellowish chestnut rufous, more or less ringed and varied with black; rest of upper surface of tail black, with a yellowish or rufous fringe, generally confined to the sides, the tip being wholly black; lower surface of tail with the central area gray, grizzled with black, with more or less fulvous suffusion.

The range of this species is western border of northern Montana, central and northern Idaho, north-eastern Oregon, north eastern Washington and thence northward into south-eastern British Columbia—in other words, the Bitterroot and Coeur d'Alene Mountains on the western border of Mon-

tana; the Lost River, Salmon River, Pahsimeroi and Saw-tooth Mountains in central Idaho, and westward in the Craig and Seven Devils Mountains to the Powder River and Blue Mountains of Oregon; thence through northern Idaho, and west in the mountains of north-eastern Washington to Colville, and northward into the Kootenai district of eastern British Columbia. The extent of its range northward along the many Rocky Mountains cannot now be determined, owing to absence of material from the area in question. It appears to reach its maximum of differentiation in the Coeur d'Alene and Bitter Root Mountains, although specimens from central Idaho (the type region) are scarcely distinguishable.

Sciurus hudsonicus streatori, subsp. nov. STREATOR'S CHICKAREE. Winter Pelage. Similar to that of S. h. richardsonii, but with much less black in the tail. Above with the broad dark chestnut rufous median band vermiculated with black; below, gray or grayish white, the hairs extensively plumbeous at base, then white strongly vermiculated with black, giving a gray effect; dusky lateral line generally wanting or obsolete. Tail above with the central area rufous chestnut, grizzled with black, and occupying nearly the whole surface, being broad and extending nearly four-fifths the length of the tail; a narrow submarginal zone of black, and a subapical broad bar of black; outer fringe pale yellowish, well developed; tail below with a very broad central area of grizzled gray and black, faintly suffused with pale fulvous.

Summer Pelage. Above similar to that of S. h. richardsonii, but general color move olivaceous and less rufous; tail, with the black portions greatly reduced and the outer yellowish fringe more developed, essentially as in winter. Lateral line very broad and black. There is much variation in the color of the dorsal surface, some specimens being dark olivaceous, as dark as in S. douglasii, while others are as ruddy as average examples of S. h. richardsonii.

The geographical range is central part of northern Washington, from the Columbia River northward over central British Columbia. It occupies the Okanagan district of Washington, from the head of Lake Chelan northward. At Lake Chelan and Fort Spokane, it meets *S. douglasii* without intergrading; at Marcus and Conconully it intergrades with *S. h. richardsonii*, which occupies the area immediately to the eastward, as it does also in the Kootenai district, in southeastern British Columbia.

S. h. streatori is closely related to *S. h. richardsonii*, with which it intergrades along the western and northern border of the range of the latter, namely, in the Kootenai district of British Columbia, and in eastern Spokane Co., Washington. Specimens from Fort Spokane, Cheney, Conconully, and Marcus, Washington, are about as well referable to one form as the other. Of five specimens from Marcus, one is typical *richardsonii*, while the others are *streatori*. At the westward in the coast region of British Columbia, it intergrades with *S. h. vancouverensis*. The northern limit of its range is not at present determinable.

It differs from true *S. h. richardsonii* in the greatly reduced amount of black in the tail, and the more olivaceous tone of its upper surface in summer pelage. It also has a much shorter tail. It differs from *S. h. vancouverensis* as pointed out under that form. Specimens from Field and Glacier, in the Rocky Mountains, on the line of the Canadian Pacific Railway, shade strongly toward *richardsonii*.

Sciurus hudsonicus vancouverensis, Allen. VANCOUVER CHICKAREE. Winter Pelage. Above like S. h. richardsonii, except that the black area of the tail is one-half to two-thirds smaller; below, gray with a brownish tinge, sometimes brownish heavily vermiculated with dusky; generally the hairs

are ashy-white, finely and profusely vermiculated with dusky, with only a slight tinge of brownish; tail nearly as in *S. h. streatori*.

Summer Pelage. Above dark olivaceous, sometimes with a tinge of reddish—nearly as in *S. h. streatori* and *S. douglasii*; below, white, generally with a tinge of fulvous, varying to a strong wash of pale yellow.

The geographical range is Vancouver Island, and the coast region of northern British Columbia, north at least to Sitka.

The Alaska specimens appear to be rather smaller than those from Vancouver Island, but the difference is probably more apparent than real, as with a few exceptions the Alaska specimens are young of the year, taken mostly in August, while the Vancouver specimens are all adult, May and June specimens. The peculiar faint yellowish wash below, which is very different in appearance from that of members of the *douglasii* group, is quite a pronounced feature in vancouverensis, though shared but in less degree, by both *streatori* and *baileyi*. In winter pelage, in *vancouverensis*, this pale fulvous or rusty tint suffuses the heavily vermiculated under surface, which is only a little less prominent, but of a different shade, than in the winter pelage of *S. douglasii*.

Sciurus hudsonicus vancouverensis was based originally on six specimens in summer pelage from Duncan station, Vancouver Island. In the original description it was compared with what is here recognized as *S. h. streatori*, no specimens of true *S. h. richardsonii* being then at hand. The measurements given were only approximate, being taken from skins badly prepared. The present material makes it possible to give full comparison with its allies.

S. h. vancouverensis is closely related to *S. h. streatori*, with which it intergrades near the coast region of British Columbia. It is a coast form, resembling in coloration *S. h. richardsonii* of the interior mountains, except that in winter pelage the ventral surface is more heavily vermiculated and more or less suffused with brownish. In this last feature it differs markedly from *S. h. streatori*, as well as in being less olivaceous and more suffused with rufous in summer pelage. It is also smaller than *S. h. streatori*, and consequently very much smaller than *S. h. richardsonii*

Review of the *Sciurus hudsonicus* Group:

The *Sciurus hudsonicus* group is made up of a number of closely related, intergrading forms, the most strongly differentiated of which, in their extreme phases, are true *S. hudsonicus* of the Arctic districts, the somewhat isolated *S. h. dakotensis* of the Black Hills region of South Dakota, and *S. h. richardsonii* of the mountains of central Idaho and the Coeur d'Alene and Bitter Root regions of northern Idaho and adjoining parts of Montana and Washington. Taking the range of *S. h. richardsonii* as a point of departure, we have two pale forms adjoining *S. h. richardsonii* on the east and south— o the east and southward the *S. h baileyi*, a pale form of the more arid region between the plains and the eastern base of the Rocky Mountains, in central and southeastern Wyoming and eastern Montana; to the southward *S. h ventorum*, a less pale form of the Wind River region and thence southward to the Wasatch range. West of the Rocky Mountains, to the northward, and cut off from the range of *S. h ventorum* by the intervention of typical *S. h. richardsonii* and *S. douglasii californicus*, we meet with *S. h. streatori*, a pale form of the somewhat arid interior of British Columbia, and to the west of this, in the Columbian and Sitkan Coast region (including Vancouver Island) the darker and more heavily vermiculated and suffused *S. h. vancouverensis*. None of these forms are strongly marked except *S. h. richardsonii*, which, however, unquestion-

ably intergrades with *baileyi*, *ventorum* and *streatori*; but the slight differences in all these forms are fairly constant (allowing for exceptional individual variation) over large areas, characterized respectfully by well marked differences in physical conditions.

Besides the differences in the general coloration of the upper parts, the greatly lessened amount and darker tint of red in the tail is a striking feature of the western forms as compared with the eastern. The red in the tail is at the maximum and lightest in tint in *S. h. dakotensis*; there is much less in *S. h. baileyi*, a further reduction and darkening of the tint in *S. h. ventorum*, *S. h. streatori* and *S. h. vancouverensis*, the greatest reduction, however, and the darkest tints occurring in *S. h. richardsonii*.

In the east, south of Canada and northern New England and northern New York, only *S. h. loquax* occurs; it intergrades at the northward with *S. hudsonicus*, with a rather broad connecting area where neither form is typically represented. Within the area of *loquax* as here assigned, there is no very well defined variation in coloration characteristic of particular areas, whatever may exist being masked by the wide range of individual variation at all seasons. Variations in size with locality, however, are quite marked, with at the same time, such gradual intergradation over the intervening areas, and with no very tangible color differences, that it has not been deemed advisable to recognize in nomenclature local variations in size, although very marked when the extremes are compared, as, for example, northern Maine and New Brunswick with southern Minnesota and Wisconsin.

As melanistic examples of the *Sciurus hudsonicus* group, are extremely rare, it may be of interest to note, that the present material includes one example, in winter pelage, wholly intense black. It was collected by Dr. W. H. Dall, at Nulato, Alaska, and is No. 8930 of the National Museum collection.

(To be continued.)

Notes on Some New England Shells.

On a visit to the New England coast, especially along the southern coast, one often meets with a long string of curious little cases, and wonders what they are. They are the eggs of the large shell Fulgar carica, Gmel., commonly called when small, Periwinkle. The animal lays its eggs in March or April. This ova case, as it is called, consists of a series of membraneous cases, from fifty to seventy in number, almost the size and thickness of an old fashioned copper cent; these are fastened together by a string or cord of the same substance, attached to their upper edges; they are placed about $\frac{1}{4}$ of an inch apart, those cases forming the center of the string being the largest; from the center to each end they taper generally in size, forming sometimes a string of cases a yard in length. Each case has eleven ribs radiating from the point of attachment, and scolloping the edges, which are beveled nearly to a point; opposite the ligament is a small opening through which the young escape when sufficiently matured; each case contains 40 to 50 embryos, which when ready to escape from their imprisonment are about one-sixth of an inch in length. The animal of Fulgar carica is large, dirty white to almost black; mantle thick, white, plain, probosis long, cylindrical, tentacles short, triangular; eyes on the outer side near the base. Carniverous in its habits, and is found more abundantly near oyster beds, where it commits great ravages.

A pretty little shell, that often presents a variety of colors and is found over an immense extent of area, is Purpura lapillus, Linn. The geographical centre of this species is in Northern Enrope, the American as

well as the Southern European and African specimens being stunted in size. Its fossil destribution extends as far back as the Red Crag of England. It is carniverous in its habits, feeding upon dead fish, mussels and bivalve shells in general. It is especially fond of oysters, and is considered a very destructive enemy of the oyster beds of England. Most of the Purpurae family contains a liquid which produces a crimson dye, obtained by pressing on the operculum or by crushing the shell. The celebrated Tyrian dye of the ancients is supposed to have been made from these animals. When this liquid is applied to linen and dried in the sun, it first appears of a light green color which changes to a deep green, then into blue, and then to a deep purple red; if now the linen be washed in hot water and soap, and again dried in the sun, it becomes of a beautiful bright crimson, which is indelible and without the use of any other reagent to set it.

One of the very commonest shells at present found is Urosalpinx cinera, Say. Its length is about one inch, and is found from Maine to Florida, inhabiting the rocks between tides and piles in harbors. The females lay their eggs in June in small transparent membranous parchment-like vases, attached to the under side of some overhanging rock, just above low water mark. The vases are attached in rows; covering an area of three or four square inches. Each female deposits from ten to more than one hundred of these vases, the process of laying occupying several weeks.

Rambles of a Naturalist.

My work has taken me over much of the territory of Colorado and New Mexico, but time—the great desideration with the observer of nature—was frequently lacking to reach correct conclusions.

The distribution of timber in these countries is somewhat peculiar. None is found in the foot hills of any consequence except an occasional grove along some stream: These groves consist mainly of cottonwood, box-elder and white elm. The cottonwoods are usually the narrow-leaved variety. But to the peculiarity. The mountains have no timber above 11,000 to 11,500 feet above sea level and they are almost equally destitute of timber below to 6,000 to 6,500 feet of elevation. The timber zone is, then, about 5,000 feet in range of altitude. To fix in the mind the distribution of timber in the mountains of Colorado and New Mexico, take a dozen or a score of over-cup or burr oak acorns and set them in an irregular row to represent a chain of mountains. Place the stem ends down and the cone ends up. The rough over-cups will represent the scrubby timber, cactus and sage brush of the foot hills. In imagination, exaggerate the fringe at the top of the cups. This belt will represent the zone of good timber—pine, spruce, etc.—while the smooth shuck—pericarp—as it extends above the fringe line—will represent the bald mountain tops that extend above timber line. The timber gives out, as one ascends the mountain slopes, almost as abruptly as does the fringe on the acorn cup. This description may not be couched in the most scientific language, but the comparison will help to an understanding of the timber distribution of the west.

In Colorado, the first growth above the cactus—tree cactus, I mean—sage brush, etc., is usually pinion—pro. pinyon—and scrubby deciduous trees, while in New Mexico, this foothill zone usually produces scrubby live oak and pinions which are followed, as one ascends, by pines, cedars and junipers. I have never observed spruce in New Mexico, but in Colorado it grows abundantly up to timber line. On Chrysolite Mountain—about 60 miles southeast of Leadville—I observed a dense growth of white and red sprnce up to an elevation of 11,500 feet above sea level.

The summer snow line is usually, on

the north sides of the mountain slopes, about from 12,500 to 12,750 feet above sea level, while on the south and southwestern slopes, the snow line—during July and August—is from 1,000 to 1,500 feet higher. In the extreme southern part of New Mexico, there is no snow and, consequently, but little timber at any elevation.

Fortunately for these countries, the timber is most abundant where there are minerals and other resources that attract population. But the timber lands of the Rocky Mountains are being rapidly denuded. As one passes up or down the narrow valleys or canons of this region, he will frequently see what appears, in the distance, to be white, conical-shaped, bee hives. A closer view reveals the fact that they are charcoal kilns. Hundreds, possibly thousands, of these kilns are gradually, but surely, consuming the timber from off the mountain sides and converting it into charcoal for the smelters at Leadville, Denver, Pueblo and other points. But the coals of these countries are being developed and already form an important item of resource. The eastern coal belt of Colorado commences in the southeastern part of the state near Cimmarron pass and extends in a westerly direction to Trinidad. From here it deflects to the northwest and extends along the base of the mountains almost to Colorado Springs—about 150 miles. As one goes up at the rate of 216 feet to the mile from Trinidad to the top of the divide—at Ratton Pass—he can not fail to observe that the coal measures nearly parallel the grade of the railroad all the way to the top. No granite or other azoic rocks appear. The tunnel at the pass seems to have penetrated carboniferous rocks only—the cap rock being a thick sandstone and, if I am not mistaken, about on the same geological horizon as the Warrensburg, Mo , sandstone.

The above grade does not average 216 feet to the mile, but the track rises about 2,120 feet in sixteen miles with several miles at a grade of 216 feet. It will be seen from these figures that the average dip of the coal or carboniferous rocks is not less than 125 feet to the mile for from fifteen or twenty miles, as the dip extends east of Trinidad.

I have seen no official figures on this coal field, but think it fair to estimate it at about 1500 square miles. The vein now mostly worked is from four to seven feet thick.

The Canon City coal at the south end of the field is not so nearly an anthracite, but is better adapted to the making of coke. Perhaps none of the coals of Colorado are equal to those of Pennsylvania for cooking purposes with the single exception of the Gunnison coal. I do not know the size of the Gunnison field, but it is undoubtedly a very important one. I tried to go over to inspect it, but the tunnel across the continental divide at the head of Chalk Gulch was not considered safe, so I postponed the proposed survey till a more convenient season.

The coal field around Como, Colorado, in South Park, is quite extensive and the coal seems to be about as good as that at Trinidad, but not so good as at Canon City.

Speaking of the coal at Canon City, calls to mind an unusual geological phenomenon. It is possible to stand on the cap rock sandstone above the coal—possibly 80 to 125 feet—and shoot a rifle ball against the granite wall of a mountain that rises 4,000 feet above you. Such a phenomenon I observed about two miles southeast of Canon City. Now, this coal belongs geologically about 2,200 feet above the granite, hence, here is a geological fault of 6,200 feet in extent! Nature has dealt with Colorado on a grand scale.

While at Canon City, let us look a little farther at the natural resources. At Florence, ten miles east, and extending for miles, is the great oil field. Here are about 230 oil wells. Tanks and derricks are to be seen on every side. Some of the best wells yield

from 200 to 300 barrels daily. Much oil is used for fuel, yet the shipments of refined oils amount to from 1,500 to 3,000 barrels per day.

Within a radius of five miles are at least 2,000 coal miners at work in the mines of Oak Creek, Coal Creek, Williamsburg, Brookside and other small places. In this neighborhood are several deposits of the finest gypsum and, at least one, of marble—very much like Cararra.

This marble crops within a few hundred feet of the railroad. The finest limestones are abundant here. The convicts in the penitentiary at Canon City are principally employed in the manufacture of lime. Much lime is made at a place about six miles southeast of Buena Vista—on the east side of the Arkansas river. At this latter place, there are large deposits of pure white calcite much used for making lime and also largely shipped to smelters to be used as a flux in the treatment of ores.

About ten miles from Leadville and extending for miles is a field that yields fine iron ores. Some of the iron plants at Pueblo and Denver use these ores, so I am informed. Much of this ore is used for fluxing certain ores.

The finest granite abounds in many different parts of Colorado.

The most beautiful I saw was in Platte canon about fifty miles west of Denver. Some of this is a beautiful flesh color. I would want no finer monument over my grave than a block of this granite

There is much water power—little of which is utilized—in various parts of Colorado. On the upper Arkansas river alone there might be developed, in seventy-five miles, several thousand horse power.

I can not stop to speak of the agricultural resources and scores of other items, of lesser importance, among which are fine clays, mineral paints, sand, gravel, artesian water, hot springs, mineral water, etc., etc.

Now, a few words on New Mexico, the sunny "American Italy." For an all-the-year round climate, New Mexico certainly easily leads any other American country. I have no interests nor friends in the territory and hope I speak without prejudice or partiality.

The mineral resources of New Mexico are certainly as great as that of any other country, but they are, with the exception of a few localites, undeveloped. Timber is not so abundant in New Mexico as it is in Colorado, but many forest abound, and wood for fuel and mining purposes is usually plentiful.

There is an undetermined coal field in the Ratton Mountains in the northern part of the territory that is a continuation of the Eastern Colorado field. I say undetermined because it is undetermined as to extent. The quality of the coal is much like that of Trinidad.

The strangest geological phenomenon I ever heard of, or saw, is presented in connection with the coal formations of New Mexico—most notably near Cerillos (pro. Se-re-os) about, say, fifty miles north of Albuquerque. Here are twenty-two veins of coal! They vary from one to seven feet in thickness. The united thickness of the workable veins is probably forty or fifty feet! But this is not the phenomenon! The upper four veins anthracite! Who ever saw anthracite above bituminous coal and in close proximity to it? Has several thousand acres been upset? If I live long enough I mean to know more of this strange formation.

East of the Pecos (Pa-cus) is said to be an extensive coal field, but I have never traveled that way.

Before leaving Cerillos, let me say that in addition to extensive mines of gold, silver and copper, it has fine iron ores, limestones for flux, the beautiful Rocky Mountain red sandstone, so highly prized for many structural purposes, white fire clay, etc., etc.

Eugene H. Cowles, the inventor of the Cowles method of manufacturing aluminum, told me that the coke and iron ores of Cerillos are as fine as the

world affords. As he is a thorough metallurgist, I think his statements are reliable.

About sixty miles south of Socorro, is some very fine marble of two or three colors. I am informed that there is an abundance of marble in several different localities in the territory. I have observed granite suitable for building purposes in many places. In Chloride Gulch, in Sierra county, I saw some fine gray granite.

The hot springs and mineral waters of New Mexico have been famed for more than a century.

The most noted are Las Vegas, Hot Springs and the Ojo Calientes—pro. O-ho Hai-en-tis—this last is Aztec for hot water.

Wherever water can be had for irrigation, the soil is wonderfully fertile. Alfalfa yields from three to four crops annually, and from two to three tons per acre for each crop. The grapes of New Mexico are the finest in flavor I ever tasted. The center of the grape industry is around Las Cruces in the famous Mesilla—pro. Mes-se-yah—valley which was obtained, as you know, by the Godsden purchase of 1853. Figs and olives flourish in the same valley. This valley is simply an enlargement—or eastern extension—of the Rio Grande valley near Las Cruces.

Notes on Spring Collecting.

BY B. O. KITTLEMAN.

After the long dreary winter with its countless days within doors, it behooves the naturalist, now that spring days are near, to prepare for work. In his retrospections upon his work, the seasons past, he finds many things that are yet to be investigated; some phase of the subject he is interested in overlooked. While arranging and cataloging his collections made during the past summer he finds he needs one or more specimens to complete a family or to replace those spoiled or injured; or in his winter's reading he may have come across some statement that he wishes to verify.

The spring season is, to the naturalist, a particularly opportune time for many of these things. To the ornithologist it speaks volumes. How anxiously, during the first warm days in March or April, does he listen for the first note of bird song. With what rapture does he watch the first flock of geese or cranes as they migrate to their summer haunts. To the botanist what glories does it not unfold? Did not his companion of last year discover a rarety for his region? And is he not equally anxious to obtain a specimen? Let the botanist who reads these lines answer. But it is to the student of insect life that these lines are addressed in particular. Spring time to the entomologist is a joyous time of the year. Even on the warm days of midwinter the enthusiast may be seen poking into stumps, turning over leaves and pulling the bark off fallen trees, in search of treasures.

When the first flowers appear in the spring or soon thereafter, many of the little insect beauties may be found hovering round them, particularly the Hymenopterous insects. This class of insects are very numerous and on account of their diversified and peculiar habits are quite popular with some students. The bees and wasps especially love the bright, highly scented flowers and the collector is almost sure to be rewarded if they are scrutinized closely. A great majority of the Diptera are also to be found in early spring hovering round the fragrant blossoms of cherry, plum, willow, elder, etc. The Diptera usually swarm from about the middle of April to June. It is well for the collector to observe a little caution when handling hairy flies, the resemblance to real bees is quite deceptive and painfully, too, sometimes. Very many of the diurnal Lepidoptera may also be found during spring, hovering round the fragrant blossoms.

A great many insects hibernate through the winter in the imago state.

This is especially true of the Coleoptera, particularly of the Curculios and Elaterids and sometimes of the Cerambycidae and Carabidae. They may be found in rotten stumps and under leaves near the margins of boggy or swampy ground, as they seek the dryer ground before the winters freeze.

As the Coleoptera are easy to capture and handle and comparatively easy to preserve they are great favorites with collectors and indeed I do not know of any more interesting objects of natural history than these. With their endless forms and varieties, interesting habits and obscure transformations, they afford excellent material to work upon. They usually appear the latter part of April, and continue until June, when the number of species gradually diminish.

In spring the collector must not neglect to pay a visit to the creek or river during its annual rise for many treasures may be found that could not have been obtained otherwise perhaps. Numerous insects are driven out of their snug hiding places by the water and forced to seek safety on drier ground. The writer once found a magnificent specimen of Walking-stick (Phasmidae) that he had searched for the whole season before without success, floating by on a piece of bark, during a rise in the river.

In conclusion I would say to my schoolmates at nature's school, to take their note-book and "game-bag" and take a trip to the country during the first warm days of early spring. Their industry will be surely rewarded if it cannot be said of them as of a potato, "eyes they have but they see not."

Ozocerite or Mineral Wax.

Ozocerite, from the Greek, "Ozein," smell, and "keros," wax, is a mineral consisting of carbon and hydrogen, and resembles paraffin, or dirty wax. Its color is generally yellowish brown. It is found in Turkistan, east of the Caspian sea; in the Carpathian Mountains in Austria; in the Apennines in Italy; in Texas and California, and specimens have recently been found in New Jersey. Commercially, it is worked chiefly in Austria and other portions of Europe, although we have in Utah a larger deposit than in any other place.

Ozocerite from Baku was found by Peterson to have a specific gravity of 0.903, and fused at 70 o C. By distillation it gave:

Paraffin - - - - -	81.8
Gas - - - - - - -	13.8
Coke - - - - - - -	4.4
	100.0

Ozocerite from Zietriska in Moldau, had a specific gravity of 0.946, fusing point 20.50 o C., and distilled at 300 o C. It occurs in thin layers of brown to yellowish-brown color. Its structure is leafy, and its fracture resembles mother-of-pearl. It dissolves in turpentine, naphtha, and fatty oils, but little in ether or boiling alcohol, and has a weak odor of coal oil.

"Earth-wax," or ozocerite, has been supposed to be a residuum of oil that has evaporated. It is dug out with picks and shovels, and is about the consistency of clay. The shafts are from 350 to 600 feet deep, and very close together; so close tnat in a piece of land containing not over fifty acres, there are ten thousand shafts. The walls of these shafts are curbed with timbers, but at the depth to which they go they are so very thin that scarcely a day passes without some of them caving in, breaking the timbers like pipe-stems, and often burying human beings beneath the great masses of earth. The earth taken out of the shafts is carted away a short distance and dumped. These huge piles of earth which accumulate exert such a pressure near the honey-combed land, that the wax is often forced out of the cracks with such rapidity that the workmen are unable to save themselves. It once happened in a shaft 321 feet deep, that the entire shaft was sudden-

ly filled to the mouth with wax. The veins of wax are from sixteen to nineteen inches thick. These layers render the strata rather uncertain—that is, they slip on each other. Great fires have also occurred in the mines. At Borislau, in Galacia, in 1864, the mines produced 45,000 hundred weight of earth wax.

The paraffin is softer and less transparent than that from brown coal tar, and has a fusing point of 60 degr C., although sometimes as low as 45 deg. C. All ozocerite oils on purification give a beautiful light yellow oil of 0.81 specific gravity, of great illuminating power and with a weak, mild odor. The lowest specific gravity of ozocerite is 0.74, while the highest is only 0.828, hence the oil has a low specific gravity and a high boiling-point. Its inflammability is therefore less than that of petroleum. The lightness of ozocerite oil, together with its large paraffin content, contradict the general idea that ozocerite is formed by the evaporation of petroleum. It must have been formed in some other way, of which we are still in doubt, perhaps, as Perutz states, by the oxidation of naphtha.

Ozocerite seems to change slightly by exposure to the air. A piece exposed to the air for a year became ash gray upon the upper surface, while on the bottom it remained a blackish brown.

Very little has been made public concerning improvements in making paraffin from ozocerite, and manufacturers keep their experience as secret as possible, In Vienna there are five factories in which are made white wax, wax candles, wax matches, yellow beeswax and colored tapers. In Europe large quantities of ozocerite are used to wax the floors of the houses.

In the United States the most important uses made of ozocerite are to make chewing gum and to adulterate beeswax.

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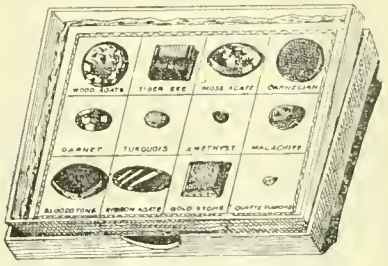

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Marbled Murrelet..... 1.00
Evening Grosbeak..... .30
American Quail, female..... .40
Great Blue Heron, male..... 1.50

Following from South Texas, made in February and March last:

Gadwell, male..... .75
Road Runner, m..... .50
Arizona Cardinal, m. f..... .20
Western Meadow Lark, m..... .20
Golden-front Woodpecker, m..... .25
Brewer's Blackbird, m..... .20
Dwarf Cowbird, m..... .20
Sage Thrasher, m..... .25
Mexican Shore Lark, m..... .15
Int. White-crown Sparrow, m..... .15
Small Sandpiper, m..... .20
Amort Titlark, m..... .12
Western Savanah Sparrow, m..... .15
Grass Finch, m..... .15
McCown's Longspur, m..... .12
Black-throated Sparrow, m..... .20
Bewick's Wren, m..... .20
Verdin, m..... .25
Sooty Albatross, one of the finest skins we have ever seen. Perfect in every detail..... 6.00

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Fine Perfect Pottery Pipe.....$4.00
" " Bowl..... 4.00
" Bowl, cracked..... 2.50
Axe, fine groove, cutting edge chipped.. .50
Good Celt..... .40
" axe, half groove..... .60
Sinkers..... .15
Scrapers, notched or unnotched..... .15
Points, poor, various states..... .01
" better, " " ..... .03
" good to fine, various states..... .10
" fine..... .20
Chautauqua shell collection, used to sell at $2.50, prepaid, have 10 will sell at..... 1.25
Cactus Wood Cane..... .50
Collection of 50 kinds of minerals, all named, etc..... .75
Special rates on 25 to 50 collections.
Ostrich Egg, African..... .85
A bargain on some big Bahama Corals weighing 10 to 40 pounds each.
Marine algae per doz. cards..... .75
Scorpion, mounted in box..... .40
Hermet Crab, in shell; all in box..... .25
Piece of Big Tree Bark, 4 x 4 inch..... .20
12 kinds of Sea Beans, all named, for..... .30
25 kinds of Foreign Birds' eggs, all named and first-class, for..... 1.50
Birds of Labrador, Natural History of Labrador, and O. & O. Manual, all for. 1.00
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Marine Algea Blotter, the top card with beautiful mountings and covered with celluloid. Very neat..... .40
Marine Algea Newspaper Clipping Case, 6 large envelopes appropriately named and bound in heavy covers, on which are beautiful mounts under celluloid, so it is not easily soiled, gold edges... .75
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Marine Algea Photo. Frame. The frame proper is covered with beautiful mounts that are in turn covered with celluloid to keep dust from soiling. Has back, so will stand on mantel or table. A beauty..... .60

The above five articles are particularly suitable for birthday or wedding gifts, being something that will be always admired. We will send on approval to any collectors, so sure are we that you will be more than pleased.

Minerals.

We carry quite an extensive stock of minerals for one who does not pretend to make it a specialty. We can always furnish several hundred kinds right from our cabinet draws, and are glad to send on approval to any one who wishes to start a cabinet.

The following kinds are sure to be in stock, and good cabinet specimens will be sent for 5c each prepaid. A much finer grade such as run 2 by 2 to 2 by 3 for 10c each.

The following fine minerals are all in stock. We will send good size cabinet specimens for 5 cents each, prepaid:

Argentite, Allanite, Arsenopyrite, Ataeomite, Agate, Asbestos, Albite, Actinolite, Amphibole, Apatite, Anhydrite, Alabaster, Biotite, Beryl, Bog Iron Ore, Bauxite, Bloodstone, Buhrstone, Bornite, Copper Pseud, Chrysalite, Chalcopyrite, Cerrusite, Cryolite, Cerargyrite, Chalcedony, Carnelian, Chert, Corundum, Cuprite, Calcite, Calcite Crystal, Chalk, Calc. Tufa, Crocidolite, Cookerite,

Celestite, Drusy Quartz, Dolomite, Elaelolite, Electric Stone, Epidote, Feldspar, Franklinite, Gypsum, Graphite, Glauconite, Genthite, Garnet, Galena, Gold Ore, Galenite, Heulandite, Halite, Iolite, Idocrase, Jasper, Kaolinite, Lazurite, Lepidolite, Labradorite, Leelite, Litho Stone, Lava, Limonite, Lignite, Leucite, Lollingite, Molybdonite, Marmolite, Magnetite, Magnesite, Monazite, Natrou, Nuttallite, Native Copper, Orpiment, Opal Wood, Opal, Onyx, Oolite, Pyroxene, Prehnite, Pisolite, Pearl Spar, Proustite, Pyroxene, Porcelainite, Pyrrhotite, Pyrites, Petrified Wood, Pectotite, Psilomelane, Quartz, Realger, Rhodonite, Rock Crystal, Rose Quartz, Rutile, Rutile in Quartz, Rhombspar, Rhodocrosite, Ripidolite, Satin Spar, Selenite, Selenite Crystal, Somarskite, Sepiolite, Sillimanite, Sodalite, Simithsonite, Siderite, Smoky Quartz, Spodumene, Sphalerite, Stibnite, Strontianite, Stilbite, Stinkstone, Sulphur, Turquois, Titanite, Thompsonite, Thulite, Uranite, Ulerite, Ullmanite, Vivianite, Vesuvianite, Wad, Wernerite, Williamsite, Zungite, Zircon xl.

Modern Beaded Indian Relics.

We have just received a large shipment of Fine Relics from a western Indian Reservation. Our man has selected a lot for us and at prices that we believe are reasonable for good relics. We will send for examination. Make up your order at once.

	EACH.
2 large head dresses of hair	$2 00
2 long scalp lock ornaments	2 00
1 fine feather head dress	3.00
4 small beaded scabbards	.70
12 fine beaded bags	75
2 beaded needle holders	70
6 pairs of fine armlets	.75
1 beaded glass, can and spooon, each	.40
1 good tobacco sack	1.50
5 beaded bottles	.40
1 squaw belt, with metal plates on	3.50
2 fiue long necklaces of beads	.80
1 pair of gloves, fine bead work	2.25
8 war clubs, assorted, all kinds	1.50
6 pairs of moccasins, assorted	1 50
1 fur neck robe	3.50
1 blanket belt	2 00
1 quill hat band	.50
1 beaded work bag	3 00
1 child's leather belt	1.50
1 pair of knee dance bells	1.25
6 heart case and bladder bags	1 00
3 pair quill armlets	.40
1 necklace of long bone beads	2.00
1 pair of gloves, with quill work	2 25
4 fine pipes of peace with handles	1.50

These relics are fast becoming hard to get. Shrewd white men establish themselves near the Indian Agencies, and manufacture Indian goods, and pawn them off on the unsuspecting public, but our customers may rest assured, that we will handle or offer nothing but genuine Indian make.

Indian Iron Tomahawks.

We were recently very fortunate in securing some of these rare relics. We have three on hand. All are in good state of preservation, notwithstanding they are of iron and must have laln in the ground for a long period. We have one with a slight crack that we offer at $2. Another just like it but perfect at $3.00. Another smaller, but of rarer design at $3 50. We also have a native copper arrow head, little over two inches long, at 75 cents.

California Condor Egg.

We have a perfect egg of this very rare bird taken this year. The egg was absolutely fresh, and preseuts characteristics in way of freshness that no incubated egg ever shows. We offer it at a reasonable cash figure, or will consider offer of part cash and part exchange, where the exchange part of the deal is desirable material. There can be no question as to this specimen giving the utmost satisfaction to the most fastidious collector.

Alcoholic Specimens.

We will send any of these specimens by mail prepaid. Customers can put them in jars to suit themselves. They are all nice specimens. We give localities

Water snake, N. Y.	$ .25
Common toad, N. Y.	.25
Spade-foot toad, N. Y.	35
Green frog, N. Y.	.20
Pink crab, Atlantic	.25
Spider crab, Atlantic	.25
Sea Anemones, Atlautic	.25
Marine algea, small jar, sev. kinds	.25
Grass snake, N. Y.	.25
Milk snake, N. Y.	.35
Spotted snake, Honduras, Cent. Amer.	.50
Mammoth hairy worm, Honduras	.30
Atlantic starfish, Atlantic	.20
"Polywogs" linch, N. Y.	.10
Helix, inflated, several species	.15
Sea urchin, Atlantic	.25
Shrimp, Atlantic	.25
Section of sponge, Atlantic	.15
Lamp shell, brachiapod, Atlantic	.25
Fiddler crab, At antic	.15
Tiger triton, Missouri	.35
Spotted salamander, N. C.	.30
Viscid salamander, N. C	.30
Dwarf salamander, N. C.	.35
American newt, N. C.	.25
Red newt, N. C.	.25
Pacific newt, Calif.	40
Brown tritou, N C.	.20
Brimleys triton, Arkansas	.50
Tree frog, N. C.	.20
Green tree frog, Mississippi	.30
Swamp tree frog, Raleigh, N. C.	.25
Cricket frog, Mississippi	20
Toothless frog, N. C.	25
Spring frog, N. C.	.20
Leopard frog, N. C.	.20
Pickeral frog, N. C.	.30
Sand lizard, N. C.	.25
California lizard, Cal.	.40
Sand swift, Ark.	.40
Ground lizard, N C.	25
Blue-tail lizard, N. C.	.25

Nice Mounted Birds.

Pair Red-breasted Merganser, on one stand	$2.50
Pair of White Willow Ptarmigan, on one stand	3.00
Male Mandarin Duck, very fine	3.00

Male Yellow-crown Night Heron, fine...	2.00
Male Tufted Puffin, fine, Alaska	2.00
Male Broad-wing Hawk.....	1 50
Good Male Mallard.....	1 75
Male White-wing Scoter.....	1.75
Male Boat-tail Grackle.....	.90
Male Gray-crown Leucosticte.....	1.00
Male White-tail Kite.	1.50
Male Canada Jay.....	1.00
Male Long-crested....	1.00
Pair American Woodcock, one stand....	2.00
Another pair, dead game, hanging	1.50
Male Louisiana Heron.....	1.25
Female Shoveler Duck.....	.90
Male Bridled Tern.....	2.00
A very fine pure white American White Pelican, an extra large specimen, and very cheap at.....	7 50

Fine Shells.

We are not able this month to give space to the listing of our shells. In fact we should hardly know where to begin or where to leave off. We will simply state here that of American shells we have species of Io, 8 species of Angitrema, 4 species of Lithasia, 6 species of Strepobasis, 50 kinds of Trypanostoma, 125 species of Goniobasis, 12 kinds of Schizostoma, 4 kinds of Eurycaelon, 18 kinds of Anculosa, 4 kinds of Vivipara, 2 kinds of Lioplax, 11 kinds of Melantho, 6 kinds of Somatogyrus, 16 kinds Physa, 12 kinds of Limnaea, besides various species of Pomatiopsis, Flumnicola, Ancylus, Amnicola, Zua, Bulinus, Tulotoma, Planorois, etc. We will sell any of the above fine samples at 10c per pair, or 5c per specimen. While this may seem a high figure, for some, still there are others that one would spend $5 to try and get a few specimens and maybe not procure over a dozen. In other words some we offer above are worth many times 5c each. We will give a discount of 25 per cent. on above prices for orders of $10 and upwards, prompt cash.

In American land shells we have about 100 kinds all correctly labelled and localized. We will make up nice assortments and send on approval, to any interested collectors at very low prices.

In Foreign and fresh water shells we have about 500 kinds at least and possibly nearer one thousand. Nice assortments of Helix, Achatinella, Partula, Helicina, Bulimus, Helix, Vivipara, etc. etc from all parts of the world.

In Marine shells we have probably 2,000 kinds on hand and shall take great pleasure in sending collectors named and priced assortments from which they may select any they wish. Our rules in such cases are that collectors are to pay charges on box sent, where by express and we agree to pay on any returned. If we send the package by mail, the customer is to return any not wanted in like manner.

All shells are priced very low, much below catalogue prices of regular dealers and we feel sure we can please you as to quality. We invite collectors to send us l sts of what they collect in American Land and Fresh Water Shells and if agreeable to exchange we may be able to offer you something for your duplicates that will be very acceptable. Of many fine foreign shells, we have a great quantity, more than we hope to sell in years and we very naturally would like to exchange some of them for other kinds that we do not have, or that our stock is very low on.

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SEND ONE DOLLAR (for your express agent a guarantee for charges one way) state whether ladies' or gents', color and height of frame w ted, and we will ship C. O. D. for the balance ($15.75 and express charges), subject to examination and approval. If you don't find it the most wonderful Bicycle Offer ever made, send it back at our expense. **ORDER TO-DAY** if you don't want to be disappointed. 50 cents discount for cash in full with order.

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We desire to announce that owing to the many improvements made in the current volume of the **Fern Bulletin,** the price of sample copies will now be fifteen cents each. Purchasers of sample copies may deduct this sum from the regular subscription price when subscribing. The January number contains fourteen articles on ferns, many shorter notes, and eight pages devoted to the Mosses. Send for it Address,

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We still have a few sets of back numbers of THE MUSEUM We will mail the entire first 4 volumes for only $2.00 prepaid; or any number you wish at 5 cents each. Fill out your files now while you can.

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Black Haliotis, 4 to 5 inch, from Monterey, Cal. 75 cents per dozen.

Red Haliotis, from Monterey, 7 to 10 inch, at $1 50 per dozen.

Strombus tuberculatus Silver Lips, 2 inch, from Singapore, at 36 cents per dozen.

Strombus alatus, Purple Mouth, from Fla., at 24 cents dozen.

E I. Coral fragments, 2 to 3 inch, 20c dozen

Melongena corona, Crown Shell, from Fla., 24c doz.

Sabre Beans, mammoth, 16 to 20 inches, curious, Bahamas, at 50c doz.

Nereis peleronta, Bleeding Teeth, Bahamas, at 50 cents quart.

Purple Gorgonias, Flexible Coral from Bahamas, $1 50 dozen

Mica Snow, for Taxidermists and fancy work, worth 80c ponud, our price 20c.

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JUNE, 1899.

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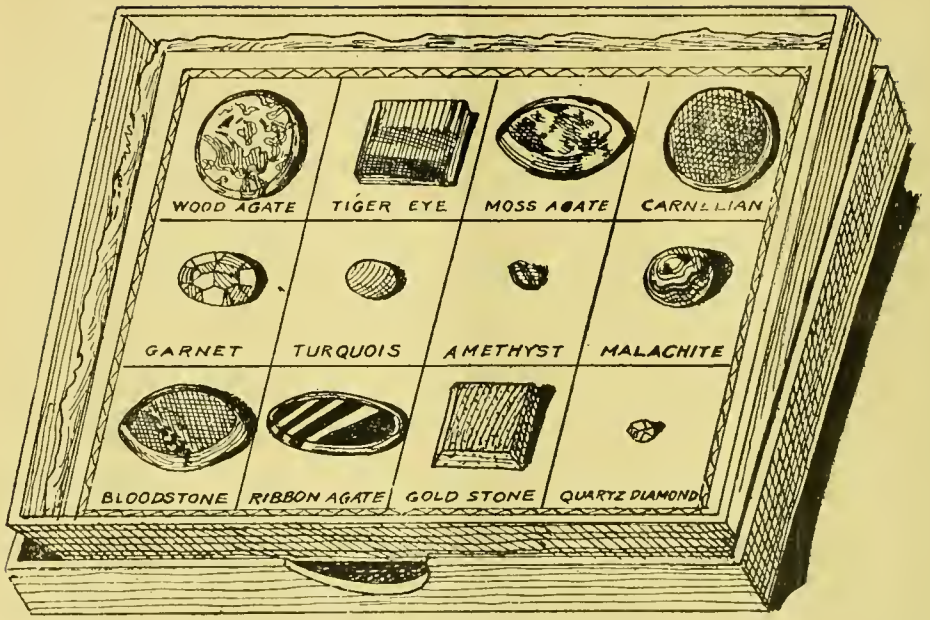

50c. Our Gem Collection, 50c.

We present this month a small drawing of our gem collection which, in a crude way, gives collectors an idea how it looks. As the stones are all finely cut and polished, they present a brilliant effect, which cannot fail to attract great attention in a cabinet. These 12 stones could not be bought of any dealer in gems for less than $3 00 to $5 00. and to take the rough stones to a lapidary and have them cut, would cost twice this figure. We believe every collector will want one of these collections. The price is only 50c. They will sell at $1.00 just as easily. Many years ago a Rocky Mountain dealer in minerals offered such a collection at $1.00. They were considered a wonderful lot for the price. In fact, it is a mystery to every one how the stones can be cut and polished and sold for any such figure as we offer. We confess we do not understand how it is done, unless the parties who do the work are laborers who receive but a few pennies a day for their labor. Send a dollar bill well wrapped in your letter for two collections, sell one of them to a friend in your place who will be interested in cut stones, for $1.00 and you have yours free. We guarantee that if they are shown to a few friends they will readily sell at $1.00. If you succeed in selling one, as we are sure you will and think there will be a demand for more, we will make you a figure on a dozen. Let us hear from you at once.

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ALCHOLICS—I have a lot of alcholic specimans that I would like to exchange for Mammal skins, or would sell at a bargain. J. K. STRECKER Jr. Waco, Tex.

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American Land Shells Wanted.

Any collector who has a good stock of above for sale cheap, we should be pleased to hear from. We will also buy Foreign Land, Fresh Water or Marine, in any quantity. Cypræa specially wanted.

WALTER F. WEBB, Mgr.,
ALBION, N. Y.

IMPORTANT NOTICE.

We desire to announce that owing to the many improvements made in the current volume of the **Fern Bulletin,** the price of sample copies will now be fifteen cents each. Purchasers of sample copies may deduct this sum from the regular subscription price when subscribing. The January number contains fourteen articles on ferns, many shorter notes, and eight pages devoted to the Mosses. Send for it. Address,

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A Monthly Magazine Devoted to Research in Natural Science.

VOL. V. ALBION, N. Y., JUNE 15, 1899 No. 8

Revision of the Chickarees or North American Red Squirrels.

Sciurus douglasii, BACHMAN. Douglas's Chickaree. Winter Pelage. Above with a broad median band of dark ferruginous, the hairs ringed near the tip with black and chestnut; rest of upper parts, limbs and feet, dark brownish gray, the hairs being ringed with a much lighter shade of ferruginous than on the back, the general effect tending to gray; dusky lateral line generally present, varying from obsolete to well defined; under parts strong buffy gray varying to ochraceous, profusely vermiculated with black, the general effect in average specimens being buffy gray. Tail above centrally for two-thirds its length of nearly the same color as the median dorsal band, but more coarsely varied with black, and with the tips of the hairs yellow or yellowish; the black submarginal zone narrow and obscured; a broad subterminal band of black; outer fringe of the tail yellow or yellowish, narrowest across the end of the tail; below, the tail is grizzled rusty and black, with the submarginal black zone and the broad subterminal black band more distinct than above, as is also the yellow marginal fringe. Ears conspicuously tufted with blackish.

Summer Pelage. Above dark olivaceous brown with a tinge of reddish, the hairs being minutely punctated with deep ferruginous; lateral line broad and intensely black; feet deep orange rufous, extending with diminishing intensity to the shoulder; ventral surface orange, varying from orange yellow to deep reddish orange; tail much as in winter pelage, but narrower and less full. In general effect the color both above and below, in both pelages is subject to much individual variation, but especially in summer, dependent upon the depth of the rufous suffusion above, and of the intensity of the orange tint below. In co-ordination with this the tail fringe varies from deep yellowish rufous to yellowish white.

The geographical range is the immediate vicinity of the Pacific coast in Oregon and Washington, from about Cape Blanco to Juan de Fuca straight. In its extreme development it is limited to within about 50 to 100 miles of the coast.

Sciurus douglasii mollipilosus, AUD. & BACH. Redwood Chickaree. Winter Pelage. Above similar to *S. douglasii*, but the median dorsal band is less dark, and the sides are more decidedly grayish in general effect; below pale buffy gray, heavily vermiculated with black. Tail nearly as in *S. cascadensis*, being fringed with white instead of yellow. The coloration below is generally gray with a slight tinge of buff, but varies to strong buff. Summer Pelage very similar, both above and below, to *S. douglasii*, except that the tail is fringed with white; the general tone of the upper parts, however, is more olivaceous and less ferruginous and the lower parts are less deeply tinted.

The geographical range is the Pacific coast region of northern California, west of the coast range, from Sonoma county north to Curry county, Oregon. Grades into *S. d. californicus* in the Siskiyou region.

Sciurus douglasii cascadensis, subsp. nov. Winter Pelage. Almost indistinguishable both above and below, from *S. d. mollipilosus*, being similarly characterized by the white fringed tail and rather paler tints, in comparison with *S. douglasii*.

Summer Pelage. More olivaceous above and less deeply orange below than either *S. douglasii* or *S. d. mollipilosus*, varying from yellowish buff to buffy ochraceous, thus strongly approaching *S. d. californicus*, with which it intergrades to the east and south.

Geographical range. The Cascade region of Oregon and Washington, north into British Columbia, including also the coast region at the mouth of the Fraser river, and north at least to Rivers Inlet, some 50 miles north of Vancouver Island. In Oregon this form prevails south in the Cascades to the vicinity of Fort Klamath; and, west of the Cascades, to Glendale, Cleveland, Eugene and Sweet Home, and in Washington, to Tenino, Roy and Snoqualmie Falls.

Sciurus douglasii californicus, ALLEN. California Chickaree. Winter Pelage. Above similar to *S. d. cascadensis*, but the median band of a much paler shade of chestnut, and the general color much lighter and grayer in general effect. Tail broad and full, with generally less chestnut at the base of the hairs and the outer white fringe much broader and intense, clear white. Ventral surface grayish white, without fulvous tinge and with little or no vermiculation, and this mainly at the sides of the ventral area.

Summer Pelage. Above similar to *S. d. cascadensis*, almost indistinguishable, in fact, but rather lighter and grayer in general effect. Ventral surface pale fulvous, varying from cream white to pale fulvous; feet ochraceous, with a conspicuous deep ochraceous band along the front edge of the thigh; fore arm, ochraceous, the inner surface only a little paler than the outer. Tail narrow and slender, usually very little chestnut at base of hairs, and the fringe pure white, as in winter, but narrower.

The contrast between the coloration of the ventral surface in true *S. douglasii* and typical *S. d. californicus*, in both the summer and winter pelages, is thus very striking, but in the Cascades region of Oregon and Washington, the two completely intergrade through *S. d. cascadensis*.

Geographical range. The Sierra Nevada region of central and northern California, north in Oregon, east of the Cascades, to the Maury Mountains and Strawberry Butte, over which region it prevails with little change and may be considered typical, and nearly typical *californicus* prevails westward in Oregon to the eastern base of the Cascades, where it passes into *cascadensis*.

Review of the *Sciurus douglasii* Group.

The present material is greatly inadequate for a satisfactory study of the *S. douglasii* group, as developed in California, Oregon, Washington and British Columbia. There are apparently three forms along the coast one of which the northern, also occurs in the interior, while a fourth is wholly confined to the interior. These are beginning at the south-west: 1. *S. douglasii mollipilosus*, of the redwood belt, west of the coast range, which extends from Sonoma county, California, into Curry county, Oregon, intergrading with *S. d. californicus* in the Siskiyou region and with *douglasii* proper at the northward; 2. *S. douglasii*, of the immediate coast region of Oregon and Washington, being confined mainly to within 50 to 100 miles of the coast, but extending also up the Skagit valley and intergrading on the east with *S.d cascadensis*; 3. *S.d.cascadensis*, of the coast region of southern British Columbia, and thence southward through the Cascades, but only in the mountains proper, but to varying distances to the base, both to the east and west, intergrading to the westward with *S. douglasii*, and to the south-eastward with *S. d. californicus*; 4. *S. d. californicus*, of the Sierra Nevada region of California and southern Oregon, ranging in the interior at least to the Maury Mountains

and Strawberry Butte, where it still retains nearly its typical features. A series of specimens from Lake Chelan, Washington, is almost referable to this form, being pale and larger, showing that it probably ranges, perhaps some what modified, much to the northward of the limits shown by the present restricted material.

The extreme phases of the group are *S. douglasii* of the coast and *S. d. californicus* of the interior, which are exceedingly unlike; the coast-forms are all considerably smaller than *californicus*, and much more strongly colored, particularly below, yet the coast and interior forms appear to completely intergrade through *cascadensis*. *Californicus* is especially characterized by the pale (creamy-white to buff) coloration of the ventral surface in the summer pelage, and in the winter pelage, by the absence in large degree of dusky vermiculations, and any tinge of yellow below. The series of 32 specimens from Ft. Klamath, representing all seasons of the year, are specially interesting, since at about this point *californicus* passes into *cascadensis*. Of 14 specimens in winter pelage, about one-half are typical *californicus*, being white below and only slightly vermiculated—about like winter specimens from the southern Sierra Nevada; the others show somewhat more vermiculation, but are all without the fulvous wash of coast specimens, except one, which is heavily vermiculated and as strongly suffused with fulvous below as average specimens from Neah Bay. Of the 18 summer specimens, all but three are typical *californicus*, differing very little from a similar series from the mountains of central California, the remaining three closely resembling average coast specimens. On the other hand, a series of 11 specimens from Siskiyou decided approaches the coast form. Specimens from the Warner and Maury Mountains and Strawberry Butte are fairly typical *californicus*.

(To be continued.)

Directions and Suggestions.

WHERE TO FIND AND HOW TO COLLECT AND PREPARE LAND AND FRESH WATER SHELLS FOR THE CABINET.

We publish the following brief notes on collecting Land and Fresh Water Shells, hoping thereby to remove some of the difficulties that usually beset the amateur collector.

The writer will, to the extent of his facilities and ability, respond to any inquiries addressed to him relative to the Land and Fresh Water Shells of the United States, and will examine and label any packages of such shells sent to him, charges paid. In such cases it is best to number two suites of the shells you desire named, sending one suite to us. We will respond, giving you the name and number, if possible, retaining the samples sent for our trouble.

Explorations.—It will be found generally, that those sections of the country that have a dry sandy soil are unfavorable for the production of molluscs Regions in which pines abound are usually of this character. In the moist alluvial soiles of limestone regions are found the most favorable conditions for the production of molluscs This is more notably true with Land Shells, but aquatic species are similarly effected, but less conspicuously.

Land Shells.—Are found most abundantly in the *wooded* alluvial regions, where during the day they are concealed under *fragments of fallen trees, bits of bark, chips, etc.*, sometimes under leaves and in rank tufts of grass. Moist debris of shaly rocks in ravines should be examined, and some peculiar species in the southern states are found on shrubs and trees. Some species of semi-aquatic habits are found under bits of flood-wood, leaves, etc., near the muddy slopes of streams and ponds. Among our more minute species, are some that may occasionally be

found, congregated in hundreds, under stray fragments of boards, bits of wood, etc., in wet grass lands, that are moist during a considerable portion of the year. Always be on the alert and examine every likely place, and your efforts will usually be well rewarded.

Fresh Water Shells.—Among the smaller fresh water shells, one is sure to find some air-breathing molluscs that are called *aquatic mollusca*. One might think they were land shells, as many species have a habit of crawling out of the water and remaining on the moist mud without inconvenience. They are also found on the stems and leaves of aquatic plants. In their habits they adopt a wide range of conditions and may be found in lakes, ponds, rivers, canals, ditches, stagnant pools, swamps and small rivulets. By far the greater number of species of this character prefer shallow water, and may be found usually along the margins. By pulling up the stems of flags or bullrush, many species may be discovered. A class of minute cup-like shells, "*Fresh Water 'Limpets*," are frequently found adhering to the sides of other shells, under the margins of stones, etc. Aside from the air-breathing aquatic mollusca, we have some whose respiration is *aquatic*. These are not usually found in stagnant waters. The largest shells of this class are found in swamps along the rivers of some of the southern states. In their season of active life they are found feeding on aquatic plants, but where the water dries up, they burrow in the mud. It is best to collect them while active. Another class, smaller than those just mentioned, but affording a greater number of species and varieties, is found all over North America. They inhabit rivers, lakes, ponds and canals, and when circumstances favor their habits will be found most abundantly, burrowing just beneath the soft mud near the shores, usually at the *margin* of the water. They frequently acquire a more luxuriant growth in canals than in neighboring rivers. Next to this class in size is one that embraces a large number of species included in several genera and sub-genera. The shells vary in form from a slender turret to globular, variously colored, and frequently ornamented with tubercles, ridges and carinations. With few exceptions, they are found in *rivers and perennial streams*. Some of these molluscs prefer *muddy sloping river banks*, where they crawl on the surface of the mud. Others prefer the rapid current among the rocky portions, where they adhere to the surface of the rocks. The habits of the majority of this class, however, are such as to bring them to the shallower portions of the water they inhabit, and they can often be reached from the shore with the hands. By gradual transitions, these genera with their numerous species are followed by other and smaller genera, some of which have a comparatively limited range and others are widely distributed over the whole country. Nearly all of them have habits in some respects similar to the last preceding class, and will be found on the muddy bottoms of shallow portions of rivers, lakes, etc., feeding on aquatic plants.

Fresh-water Bivalve Shells.—Might be divided into two classes, small and large. The small forms, none of which are ever over a half an inch long, inhabit nearly every perennial stream having a muddy bottom. Also found in *stagnant waters*, *lakes*, *ponds*, *canals*, and indeed, in every station fitted for mollusc life. They all burrow just *beneath the surface of the mud*, and are found in greatest abundance near the margin of the water, or where there is but little depth. Some of the species are extremely frail, and some are very minute. The larger bivalve shells, called Fresh Water Mussels or Fresh Water Clams, embrace a large number of genera and sub-genera. No country in the world produces as great a variety of forms as the United States. In the north-eastern

part of the United States the number of species are not great, but in the south and middle west the variety is almost endless. They inhabit *lakes, rivers and canals.* Small semi-aquatic mammals feed on them in abundance. Large quantities of them are now used in manufacturing pearl buttons and other pearl articles, and immense numbers of the shells in Wisconsin, Iowa, and other states through the Mississippi valley have been collected and examined in search of pearls. The shells are usually found *partly* buried in the mud or gravel. Having now spoken of most of the classes of shells one will be apt to find, we will turn our attention to

Collecting.—To collect Land Shells, small tin boxes are suitable. It is best to have several, so one may keep different sizes by themselves to some extent. A very little experience will enable one to tell a young shell from a mature specimen. It is best not to collect many of the former, but leave them for some future visit. One should always be provided with a small bottle of alcohol and put all minute forms into this. A small pair of tweezers is very handy to handle them with, as many are very fragile. Many of the small aquatic species are handled best in this manner. The small "Fresh Water Limpets" before mentioned, can be handled best with a blade of a knife, when they may be removed to the bottle. Many aquatic species may be rapidly gathered with a dipper, which is perforated in the bottom A jointed handle may be fitted to it, and thus be used in a variety of stations. After dipping up some mud, it can be jently washed away in the water, and the shells that remain in the bottom of the dipper removed to a pail partly filled with water The Fresh Water Mussels can usually be collected with the hand where the water is shallow, and a market basket will be found handy to put them in. In places where it is inconvenient or impossible to wade, a rake with a long handle will be found handy. One of greater utility can be made having curved teeth, and with teeth in the end. An instrument of this character can be used from a boat handily in ten to fifteen feet of water. When a species is found abundant, it is best to collect a large number, as the habits of many species are affected by inappreciable influences, and often those that were most abundant, cease to be so, much to the disappointment of the collector.

Preparation of Specimens.—The large shells of all kinds, down to one-half an inch in diameter, may have the soft parts removed easily by pouring boiling water over them, and using a small metalic hook. The smaller sorts best be put in alcohol when first collected, and after 24 hours then may be removed and dried in the sun. The reason of this treatment is, that the alcohol causes the soft parts to contract into the smallest possible space within the shell, and also dries up when in the sun more readily, and with less of the offensive odor of decomposition than when dried in the usual manner. Also the shells present a more cleanly appearance after alcoholic treatment. If a weak solution of alcohol is used they may remain in it for two or three days. The best way to remove dirt and mud from small shells that are too minute to handle, is to place them in a small dish or vial, and put in equal parts of clear sand, such as one finds on our large lakes or ocean. By agitating the vial or dish in a rotary motion for a few moments, the friction of the shells and sand will very quickly brighten the surface of the shells. This may be done before the animal is removed or before their treatment with alcohol if desired.

Preparation of Starfish.

Having had many inquiries from Coast collectors and those intending to visit the Coast, how to prepare the little starfishes, we recommend the following:

Take live specimens and place in flat dishes of warm water (back up) and when soft and pliable, which will be in a few minutes, change to flat dishes of one-third water and two-thirds alcohol, and let them stand twenty-four to forty-eight hours, covered with the liquid. Take them out and place on boards to dry for a day or two in the sun or by artificial heat as the case may be. From the time that the animals are taken from their warm bath care should be exercised that the arms are systematically arranged; dry them first back up, then when somewhat stiff turn over, and do this until perfectly dry. Fresh warm water kills and makes them pliable, alcohol hardens, and evaporating carries out quickly from the body such liquids as remain.

A Trip After Meteorites.*

BAKU ON THE CASPIAN, RUSSIAN TRANSCAUCASIA,
February, 1899.

MY DEAR BEMENT:—

Since sending you my previous letter, in which I announced a visit to Persia, I have successfully made that trip, and am once more back in this Caucasian Caspian seaport. Let me tell you a little about my trip, which in the outset, and before it was dignified by success, I called (to myself) the veriest wild-goose chase; the very wildest still-hunt of quite a few which you know I have made in these past years after coveted specimens.

You perhaps remember that Flight in his meteorite book notes a Persian meteorite called Veramin, which fell some twenty years ago and became the property of the Shah. Now, why should I not go to that distant and interesting country, interview His Majesty, see Veramin, and get a piece of it for my collection! So thought I, and when in St Petersburg two months ago I took a first step in my plan by obtaining from the Persian Ambassador, resident in the Russian capital, a letter of introduction to the Grand Vizier of the Shah at Teheran. Then when I had finished my meteorite work in the museums of North and Central Russia, had crossed the Caucasus and had come to this city and writt n my notes to you, I decided, as I informed you, to cut loose and go to Persia. So, with a preliminary invocation of *Jupiter tonans*, who you know is the patron Deity of meteorite-hunters, I boarded a Caspian steamer and sailed away southward. For two days and nights we followed the eastern coast, the low shore having a magnificent background of high snow-capped mountains—the south-eastern prolongation of the Anti-Caucasus range. These mountains at length swung around to an east and west trend, and, now called the Elburz range, crossed our track and reached far away eastward toward Afghanistan. The Caspian ended, and we went ashore at the little port of Enzeli, on the north border, or coast, of Persia. There I joined with several of our passengers, who, like myself, were headed for the capital, and engaged riding-horses and baggage-mules for our caravan-trip of about 300 miles to Teheran.

I must not tell you of the incidents of this trip. They were legion, but to narrate them would take me too far from the specific subject of this letter. Suffice it to say that we had six days of delightful views of nature in her grandest display in the valleys and ravines and slopes and cliffs and colossal peaks which we went through, over, and among in mounting to the pass over the Elburz mountains, 7,000 feet above the sea-level. Six days delighte in the natural beauties and the country's novelties which were offered us, yet most wearisome from the fatigues of wretched horses, poor food, and beds upon the hard dirt floors of dilapidated caravanseries and crumbling mud huts at which we stopped wherever night overtook us. Then two days more, part of horse-back and part of carriage, took us across the

plain of Northern Persia and in full sight of Demavend, the great extinct volcano mountain 19,400 feet high and covered with a beautiful sheet of snow, to the north gate of the great walled city of Teheran—the capital and metropolis of the Empire. What I did during my stay of two weeks in this great Persian city must wait in its narration till we meet. Now I will only tell you of Veramin—that magnet meteorite which had, all irregularly, pulled me with its strong attraction so far away to the south.

After a few days in this city I had obtained audience with the Grand Vizier at his palatial residence. He spoke and understood French; so I told him in simple, unvarnished words the object of my visit. I had heard clear in distant America of a famous stone which had fallen from Heaven many years ago, and was now in the Palace of the Shah. That I wished to see it, to examine and weigh and photograph it, and also, if possible, to obtain a piece of it for my collection of these wonderful objects. His Excellency informed me that it would be possible to bring about most of my requests as stated, but that he doubted very much my being able to obtain a fragment, even ever so small, of the precious and somewhat celebrated stone. He would, however, at an early day be called to see His Majesty the Shah, and that he would then bring up the subject, and ascertain what might be done. In fact, after a few days' delay I received a letter from the Grand Vizier, enclosing word from the Shah inviting me to call on the following day with him and with the American Ambassador, who had interested himself actively in my behalf.

We went promptly the next day to the Palace; passed the guard at the outer and inner gates, traversed, one after another, many courts with fountains, and wandered through the mazy pathways of the Gulistan, or Garden of Roses, before we reached the entrance part of the noble edifice. We were joined at the grand staircase by the Guardian of the Palace and one or two court attendants, and with them we proceeded at once to the hall of the Peacock Throne, where the audience was to be given. Our little party—including the American Ambassador, the Grand Vizier and myself—walked down the hall with as much circumstance and dignity as if we were representatives of some foreign potentate on a mission of importance to the state, instead of being in the main led and motived by a Yankee seeking a meteorite for his cabinet. At the further end of the hall, and immediately in front of the throne, stood His Imperial Majesty the Shah, Mozuffer-ed-Din ("Victorious of the Faith,") whom, when you meet on such occasion, it is proper to address as "King of Kings," or "Asylum of the Universe." He stood before us quite unattended; a middle-aged man of medium height, somewhat stout and portly in figure. He was dressed in a plain civilian suit of light blue, his coat buttoned in front to the chin, and his skirts, which were long, had voluminous folds and pleats which made it stand out in the peculiar heavy manner distinctive of this article of Persian dress. Our audience being a private one, he wore no decoration and no insignia or jewels save one large diamond in the front of his *kola*, or head-dress of astrakhan wool, which is in shape like a Turkish fez without the tassel. We of course made our bows in the lowest and most impressive manner. His Majesty opened the conversation with "Bon jour"; which words, uttered in an explosive manner, proved to be the limit of his French. Our conversation thereafter, in which the Grand Vizier changed my French into Persian for His Majesty's benefit, and His Majes y's Persian into French for my benefit, seemed to roll chiefly upon meteorites. His Majesty was curious to know more or less about their place of origin, the places in which they had fallen, their general composition, and particularly if any of

them contained silver or gold. I have to confess that, with all my efforts to interest him, he appeared to have a rather tired and bored look, and not to be particularly anxious to prolong the audience. Under the circumstances, I myself felt in the same way; in short, our interview reminded me strikingly of Mark Twain's account of his first meeting with General Grant at the White House, at which he felt considerably constrained and overcome, but met the difficulty by frankly saying: "Mr. President, I feel a good deal embarrassed, don't you?"

However, one point in our conversation with the Shah particularly interested me. This was when, turning to the Guardian of the Palace, who stood at his right, he made some remark, illustrated by the fingers of one hand crossing the other; at which the Grand Vizier, speaking to me, said: "His Majesty says you may have a piece of the meteorite." This declaration having been made, and I having duly given my thanks, I bade a respectful farewell, and our whole party, leaving him standing, backed out the entire length of the long hall, at the infinite risk to some of us of suddenly sitting down in an ungraceful manner. Reaching the door, we passed out, and our interview with His Imperial Highness, Mozuffer-ed-Din, "Victorious of the Faith," "King of Kings," "Asylum of the Universe," was ended.

As we descended the staircase the Guardian of the Palace informed me that in two days His Majesty would go to the mountains for a week's hunting, and that then would be a proper time for me to come to the Palace to carry out my work. Accordingly, after two days I returned with our consul; a German photographer whose services I had engaged; and a Persian servant bearing a huge pair of scales which I had borrowed at the hotel. We found the meteorite on a low stand upon the floor of the museum hall. It was a mass shaped like an oblong loaf of bread, about 16 inches long by 12 inches wide and 8 inches thick; its corners rounded and its surface covered with the characteristic deep pittings. We at once put it in the scales, finding its weight to be just 113½ pounds. We then placed it upon the stand in the center of the hall and photographed it from several sides and at various distances, bringing into most of our pictures some views of the hall itself. In one of these we induced to stand by the side of the specimen, the Guardian of the Palace, a staid and portly gentleman. We then had the specimen carried down the Palace steps, across the Gulistan, into one of the small paved courtyards, where I undertook to break off the piece which the Shah had promised me.

I found this to be no easy matter. Had the mass been a Siderite, I might have cut it with my steel saw, or had it been an Aerolite, I might have broken off a piece with a hammer; but it was a Siderolite, a mixture of both iron and stone, so tough as to be almost impossible to fracture. Furthermore, it had no corners or salient points which I could attack. I sent out to the street for a smith, who came with a huge hammer and smote the mass a score of times with all his force, almost without any effect—so hard was it. After two hours' work he had succeeded only in crunching off a dozen or more small fragments, weighing together but about half a pound. It then occurred to someone that we should take the meteorite to the Arsenal, and there undertake to cut it by machinery. Receiving permission from the Guardian of the Palace, who—very wisely, as I thought—sent his son along to see that the entire mass should not get away to Rochester, I put the specimen in a carriage and drove to the Arsenal, a low stone building in another part of the city. There we fortunately found an old steam planing machine. The engine and boiler which should move it being out of order, we were obliged to attach men—ten or twelve of them—by

a rope, and operate it by hand. This work required two nights and one day, so hard and refractory was the mass. We at last succeeded, however, in cutting off a piece weighing between two and three pounds. I returned the main mass to the Palace, and congratulated myself upon the happy outcome of a mission which in its projecting and its carrying out had been so much of a venture. The specimen which I obtained will show nicely in my collection of meteorites, which is fast becoming one of the largest in America. In its inner structure it more nearly approaches our Miney from Taney Co., Mo., than any other Siderolite which I know.

I must not omit to state that this meteorite fell in May of 1880, on the plain of Veramin, twelve miles away to the east from Teheran. I expect soon to describe it, and, with some added facts, it will retain its place in scientific literature as the "Veramin Meteorite."

Although my letter is of meteorites, I will not rush you out of the Palace without first showing a room, one of many which I visited, which would, I am sure, have delighted your mineralogical soul.

This is the museum hall, where are exhibited not only the royal regalia of all the Shahs of the present dynasty, which dates back for nearly two centuries, but also the past collection of *objects d'art* and curiosities which the generosity of crowned heads or his own whims enabled the father of the present Shah to mass in his reign of nearly fifty years. Here is an infinity of objects far too numerous for me to undertake even the most meagre description of them. Some, indeed, are childish and not worthy of description; others, like the swords of Tamerlane, the great Mongolian conqueror of the fourteenth century, and that of Shah Ismail, with many other Persian antiquities, are of highest historical value. But the objects in this hall which most attract the visitor and make it unique among all halls in the world, are the infinity of gems, cut or uncut, or set in every kind of object and in every variety of pattern. Here is a massive arm-chair with a lofty back, which is covered over every inch of its surface, with rubies and emeralds applied in pleasing combinations. The greatest wonder, and probably the most valuable single object in the hall, stands upon a low table centrally in the room. This is the famous Jewel Globe, which was constructed out of his loose gems by the late Shah. It is a common globe about a yard in diameter, on which each of the countries of the earth is depicted by gems of one kind covering its surface. Thus, the oceans are a solid surface of emeralds, England and France of diamonds, Africa of rubies, India of amethysts, and Persia with her national stone, the turquoise. Thus the whole great globe is a surface of gorgeous, sparkling color, and of priceless worth. The alleged value of the whole (75 lbs. of pure gold and 51,366 gems) is 947,000 pounds sterling, or nearly five millions of dollars.

But I must not go on further, for a full description of the jewels in the possession of the Shah—said to be unequalled by any other potentate in the world—would take me too far.

Having with the acquisition of my meteorite attained the purpose of my trip, and apprehensive of the snow, which had begun to fall heavily upon the mountains, I took a hasty departure from Teheran and returned in eight days, in carriage and on horseback, by the same way in which I had come, to the Caspian, and from thence to Baku, the point from which I had started.

And so my Persian meteorite hunt ended.

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* Letter from Professor Henry A. Ward to Mr. Bement, of Philadelphia, in June *Mineral Collector*.

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1. **Indian Pottery.** This is a fragment of pottery from the famous mounds in Ohio.

2. **Yellow Sea Bean.**

3. **Red Sea Bean**

4. **Black Sea Bean** The above three "Sea Beans" are found in the Bahamas. The natives call them "Nickers."

5. **Calnese Horn Nut.** A curious nut found in China shaped like an animal's horns.

6. **Egg Capsule of Periwinkle** This large mollusk is found all along the Atlantic shore. It lays its eggs, consisting of a long string of these capsules, [illegible] on seaweed.

7. **Sand Box Shuck** This is a portion of a curious nut found in Central America. The nuts when drying, at a certain stage, explode with a loud report.

8. **Alligator Tooth.** Specimen taken from an animal in South Florida.

9. **Tarpon Scale.** The Tarpon is one of the noted game fishes of Florida. It is justly called the "Silver King" as each scale is tipped with a silvery color.

10. **Job's Tears.** Curious hard seeds found in British Guinea. They are strung on strings and extensively sold in various parts of the world as beads.

11. **Black-eyed Susans.** A handsome small red seed with a black spot on same. Found in the Bahamas.

12. **Miamosa Seeds.** Found in the Bahamas and extensively used by the natives in the manufacture of ornaments, as fancy bracelets, etc.

13. **Castor Oil Bean** Found growing wild in the Islands of the Bahamas Ours were received direct from there as well as the rest of our curios in that section from our special collector.

14. **Foreign Land Shell** This pretty Snail, *Helix pisania*, comes from Italy.

15. **Bleeding Tooth Shell.** This curious shell, *Nerita peloronta*, has teeth like projections with red blotches on same Found in Bahamas.

16. **Ring-top Cowry.** A curious shell with glistening enamel, *Cypraea annulus*. Found throughout the East Indies. Most specimens have a distinct ring on the top.

17. **Money Cowry,** *Cypraea moneta*, is found largely in the Indian Ocean, where for years it has been collected in large quantities and used in barter with the natives of North Africa.

18. **Tectarias,** *Tectarius muricata*, is a small shell with elevated spire the whole covered with little nodules. Found in the East Indies.

19. **Oliva biplicata** Found along the shore of California They burrow in the deep sand, and tourists find great sport in digging for them.

20. **Worm Shell,** *Vermetus spiratus*, is a curious Florida shell. It grows in large clumps in shallow water.

21. **American Fresh Water Shell.** This specimen, *Trypanostoma* from Tennessee, is a sample of the immense class of American Fresh Water Mollusca.

22. **American Land Shell,** *Helix exoleta*, from Indiana, presents a very good type of the great class of American Land Shells

23. **Purpura saxicola** is found on the Pacific coast. The Purpura shells are what the ancients used in the manufacture of dye.

24. **Limpet,** *Acmaea spectrum*, is found commonly at Santa Barbara and adjoining coast. They adhere very firmly to the rocks.

25. **Beehive Shell** This curious shell, *Cerion uva*, shaped like a miniature bee-hive is typical in the Bahamas. A larger number of species have been discovered there than in any portion of the world. Common in the salt marshes and pools.

26 **Drill Shell,** *Urosalpinx cinera*, is found commonly on the piles of wharves along the Atlantic coast It is a ferocious little mollusc, attacking other large shells, drilling small holes through their shell, and killing the animal. It has produced much havoc among the oyster beds.

27. **Button Shell.** *Umbonium*, is a little button shaped shell found along the shores of Ceylon.

28. **Satin Spar** is a form of Gypsum from Cumberland, Eng., having a satiny effect. It is used largely in the manufacture of jewelry.

29. **Petrified Wood** is found in many sections of the Western States. This comes from Central Montana.

30. **Mexican Onyx** is a compact mineral which takes a fine polish and is used largely nowadays in the finishing of expensive buildings. It comes from New Mexico.

31 **Petrified Coral.** This specimen of coral that lived in past ages is from the Niagara Formation, which crops out at Cincinnati, Ohio. It still shows the structure of coral

32. **Petrified Nautilus.** This is a regular miniature Nautilus, *Scaphites nodosus*, is found in the Bad Lands of Montana.

33. **Petrified Shell.** Sample of a perfect petrified shell from the Hamilton Group of New York state.

34. **West Indies Coral.** Small specimen from the Bahamas in many respects the handsomest species found growing there.

35. **East India Coral.** Specimen from Singapore, showing a much different style and structure from No. 34.

36. **Yellow Coral** is from Tahati. It grows in small clusters on the rocks. The color is natural.

37. **Organpipe Coral** is another curious form of recent red coral found at Singapore. No other specimen approaches it in form.

38. **Precious Coral.** This specimen is polished and in this form used to be manufactured into necklaces. It is found on the bed of the sea near South Italy.

39. **Coralline** from Africa. It is a curious growth between a true coral and a sea weed

40. **Yellow Sea Fan.** Found in the Bahamas shows a very curious structure.

41. **Purple Sea Fern.** These large Purple Ferns frequently grow six feet high in the West Indies Islands.

42. **Sponge,** This is a piece from a mammoth Cup Sponge that grows in one large cup shape three feet high in Mauritius.

43. **Starfish.** Arm of one of these queer animals found along the Atlantic coast.

44. **Sand Dollar.** A small animal allied to a Starfish, living in shallow water along the Atlantic coast After laying on the beach it frequently bleaches out white and looks like a "dollar."

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Male Canada Jay	1.00
Pair American Woodcock, one stand	2.00
Another pair, dead game, hanging	1.50
Male Louisiana Heron	1.25
Female Shoveler Duck	.90

Fine Shells.

We are not able this month to give space to the listing of our shells. In fact we should hardly know where to begin or where to leave off We will simply state here that of American shells we have species of Io, 8 species of Angitrema, 4 species of Lithasia, 6 species of Strepobasis, 50 kinds of Trypanostoma, 125

species of Goniobasis, 12 kinds of Schizostoma, 4 kinds of Eurycaelon, 18 kinds of Anculosa, 4 kinds of Vivipara, 2 kinds of Lioplax, 11 kinds of Melantho, 6 kinds of Somatogyrus, 16 kinds Physa, 12 kinds of Limnaea, besides various species of Pomatiopsis, Flumnicola, Ancylus, Amnicola, Zua, Bulinus, Tulotoma, Pianorois, etc. We will sell any of the above fine samples at 10c per pair, or 5c per specimen. While this may seem a high figure for some, still there are others that one would spend $5 to try and get a few specimens and maybe not procure over a dozen In other words some we offer above are worth many times 5c each We will give a discount of 25 per cent. on above prices for orders of $10 and upwards, prompt cash.

In American land shells we have about 100 kinds all correctly labelled and localized. We will make up nice assortments and send on approval, to any interested collectors at very low prices

In Foreign land and fresh water shells we've about 500 kinds at least and possibly nearer one thousand. Nice assortments of Helix, Achatinella, Partula, Helicina, Bulimus, Helix, Vivipara, etc. etc from all parts of the world

In Marine shells we have probably 2,000 kinds on hand and shall take great pleasure in sending collectors named and priced assortments from which they may select any they wish Our rules in such cases are that collectors are to pay charges on box sent, where by express and we agree to pay on any returned. If we send the package by mail, the customer is to return any not wanted in like manner.

All shells are priced very low, much below catalogue prices of regular dealers and we feel sure we can please you as to quality. We invite collectors to send us lists of what they collect in American Land and Fresh Water Shells and if agreeable to exchange we may be able to offer you something for your duplicates that will be very acceptable Of many fine foreign shells, we have a great quantity, more than we hope to sell in years and we very naturally would like to exchange some of them for other kinds that we do not have, or that our stock is very low on

Collections.

The Young Naturalist's Marvelous collection, consists of 44 specimens, as follows: Indian Pottery, Yellow Red and Black Sea Beans, Chinese Horn Nut, Egg Capsule Periwinkle, Sand Box Shuck, Alligator Tooth, Tarpon Scale, Jobs Tears, Black eye Susans, Miamosa Seeds, Castor Oil Bean, Foreign Land Snail, Bleeding Tooth, Ring Top Cowry, Money Cowry, Tectarias, Olive, Worm Shell, American Fresh Water Shell, American Land Shell, Purpura Limpet, Beehive Shell, Drill Shell, Button Shell, Satin Spar, Petrified Wood, Mexican Onyx, Petrified Coral, Petrified Nautilus, Petrified Shell, W I. Branch Coral, E I Branch Coral, Yellow Coral, Organpipe Coral, Prescious Coral, Coralline, Yellow Sea Fan, Purple Sea Fern, Sponge, Starfish, Sand Dollar.

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VOL. V. NO. 9.

JULY, 1899.

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A Monthly Magazine Devoted to Research in Natural Science.

VOL. V. ALBION, N. Y., JULY 15, 1899 No. 9

THE MUSEUM.

A Monthly Magazine devoted to Ornithology, Oology, Mollusca, Echinodermata, Mineralogy and Allied Sciences.

Walter F. Webb, Editor and Manager

Albion, N. Y.

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Revision of the Chickarees or North American Red Squirrels.

(Continuation of Review of the *Sciurus douglasii* Group.)

In the interior forms the tail is fringed with pure white—broadly so in *californicus*, more narrowly in *cascadensis*—and with yellow or yellowish in the central coast form (*douglasii*). There is, however, much variation in this respect, both individual and geographical, the fringe of the tail being occasionally decidedly yellowish white rather than yellow at localities on the coast, and again yellowish white instead of white at some localities in and east of the Cascades; while over quite a belt about midway between the west base of the Cascades and the coast, the tail fringe averages yellowish white rather than either yellow or white, this belt being occupied by intergrades between *douglasii* and *cascadensis*. In large series from points on the coast, usually about one specimen in ten has the tail fringed with white.

S. d. cascadensis is really little more than a vast assemblage of intergrades between the interior (*californicus*) and coast (*douglasii*) forms, as a whole much nearer *douglasii* than *californicus*. The examination of much further material will be necessary to determine whether or not it is a sufficiently stable and distinct enough form to warrant permanent recognition.

It may here be noted that there is a marked tendency to albinism on the ventral surface in the whole *S. douglasii* group, less pronounced, however, in *californicus*. owing to its under surface, than in the other forms. This is manifested in the presence of a white spot in the axillary region, varying in different specimens from a few white hairs to a large area of white.

It is more frequent at some localities than at others; thus in British Columbia, at Port Moody, in a series of 17 species, only two are thus marked, and none in 15 from New Westminster, while out of 22 from Agassiz, Sumas, Mt. Lehman, etc., one in three have more or less white in the axillary region. In Washington (various localities) only about one in twelve is thus marked. In 98 specimens from various localities in Oregon 22 are marked with white and three out of 15 from the coast of Northern

California. Specimens with much white in the axillæ are apt to show traces of white elsewhere on the lower parts, as on the lower part of the throat and middle of the breast.

* * * * * *

Sciurus mearnsi (Townsend) MEARN'S CHICKAREE. Winter pelage similar to *S. d. californicus*, but paler and grayer above, with the dorsal band a paler, more yellowish shade of chestnut. Summer pelage probably similar to that of *S. d. californicus*, but lighter above and with the lower parts only faintly washed with cream white, and the feet both front and hind, very much paler ochraceous. Only four specimens have been examined from Lower California, San Pedro mountains, April and May, and hence in worn winter coat. The feet have begun to show the coloration of the summer pelage and in one specimen this is well developed over the anterior two-thirds of the ventral surface. The hind feet are white with a faint tinge of fulvous; the fore feet are in change to strong buff. The fulvous tints on the lower parts and particularly on the inner surface of the fore limbs shows that the affinities of this form are with *S. d. californicus* rather than with *S. f. mogollonensis*. In other respects it is quite as near the latter as the former, the general coloration of *mogollonensis* and *californicus* being often closely similar. *Sciurus mearnsi* is separated from the range of both *californicus* and *mogollonensis* by a wide interval of country, where at the present time no representative of either group exists, or apparently can exist. It seems, therefore, proper to treat this form as a fully seggregated species, there being no possibility of its intergradation with either of the northern affines, which it still so closely resembles, being evidently a recent derivative of the *californicus* stock,

Sciurus fremonti (Aud. & Bach.) FREMONT'S CHICKAREE. Winter pelage, Above gray with a broad, not sharply defined median band of pale yelllowish rufous; the hairs of the median band are plumbous at the base, broadly tipped with yellowish rufous and ringed with black, with a general gray effect, fore and hind limbs, including upper surface of feet, like sides of body; an obscure nearly obsolete dusky lateral line; below, grayish white, rather profusly annulated with dusky. Tail above with the central hairs yellowish rusty, rather brighter than the middle of the back, varied with black, forming a distinct lateral area; lateral hairs fulvous basally, subapically broadly banded with black and tipped broadly with white; terminal fifth or sixth black, slightly fringed with white; below, gray or pale gulvous gray centrally, with a broad zone of black and a conspicuous fringe of white; ears slightly tufted with dusky.

Summer pelage. Above nearly uniform yellowish gray, varying in different specimens to pale rufescent gray; upper surface of feet ochraceous, the fore feet, including fore arm, brighter and stronger ochraceous than the hind; a strong deep black lateral line; ventral surface white or grayish white; tail colored nearly as in winter, but narrower, and edged more narrowly with white.

Geographic range. The mountainous portions of Colorado reaching the extreme southern border of Wyoming at Woods P. O. and Unitah Mountains of Utah; also reaching the southern boundary of Wyoming at Fort Bridger.

The type locality of *S. fremonti* is not definitely known. Audubon and Bachman state in their original description of the species "We possess no information in regard to this animal further than that it was obtained on the Rocky Mountains" They further say "The only specimen we have seen was obtained by Col. Fremont; it was procured on the Rocky Mountains on his route by the South Pass to California." Baird, evidently

loosely paraphrasing Audubon and Bachman, says the specimen described by Audubon and Bachman "Was collected in 1849 (lege 1844?) by Col. Fremont somewhere in the vicinity of the South Pass, and is now in the Museum of the Philadelphia Academy of Natural Sciences. He identified with it a specimen from Sawatch Pass, Rocky Mountains, these two specimens being," he says, "all that as yet have come to the notice of naturalists."

Through the kind intervention of Mr Whitmer Stone of the Philadelphia Academy of Natural Sciences, I have in hand the type specimen obtained by Fremont. It proves to be the form of Chickaree found throughout the Rocky Mountains of Colorado, to which the name *fremonti*, since 1857, has been currently applied It shows also that it could not have come from "the vicinity of South Pass" at the southern end of the Wind River chain in Wyoming, the form there being the very different *S. h. ventorum*. An examination of the type shows it to be in winter pelage, the soles being thickly furred, the ears well tufted, and the general pelage being that of winter or late spring. Even the feet, where change to summer coat first begins to appear, show very little departure from winter conditions. The specimen might have been taken in May or even as late as the middle of June. The label on the specimen (285 Type) is evidently of very recent date and erroneously attributes the specimen to "J. K. Townsend" and gives the locality as "South Pass, Rocky Mts" I wrote to Mr. Stone regarding this point and he kindly replied as follows under date of May 20, 1898: "The specimen, along with others, seems to have been presented by Townsend to our Academy; he apparently received it from Fremont. You will notice that Audubon (and Bachman) gives the species as *S. fremonti*, Townsend. The occurrence of Townsend's name on the label instead of Fremont's is due to the fact that museum records of old days seem to have placed more stress on the donor than the collector. The label now on the specimen I transcribed from the base of an old stand, about 1890, on which the animal was mounted There is no other specimen of *S fremonti* in our collection."

From the above it is evident beyond reasonable doubt this specimen is the actual type of Audubon & Bachman's "*Sciurus fremonti*, Townsend." It therefore becomes important to determine as near as possible the type locality. Reference to Fremont's Reports to the U. S. War Department show that his two visits to the region of the South Pass were respectively in August, 1842, and August, 1843, and that the season alone thus rules out of consideration this locality as the source of the type *Sciurus fremonti*. On his return journey, in 1844, he skirted the southern Wasatch Mountains as far north as Utah Lake, and then turned eastward to the north fork of the Platte in Colorado, which he reached June 11th, passing up the North Platte to the headwaters of the Arkansas, and down this river to the plains at the present site of Pueblo, Colorado, which point he reached June 29th. The specimen which became the type of *S. fremonti* could not have been taken in the Wasatch range, as the present material shows that the form of Chickaree occurring near Utah Lake is *S. h. ventorum*. On the other hand it might have been taken in the Park region of Colorado, where this and only this form of Chickaree is known to occur, and the season June 11th to 26th, fully agrees with the condition, as already stated. Probably, therefore, the Park region of central Colorado may be safely considered as the type locality of *Sciurus fremonti*.

Sciurus fremonti neomexicanus, subsp. nov. TAOS CHICKAREE. Winter pelage. Similar to *S. fremonti*,

but the median dorsal band much brighter yellowish rufous, nearly as in *S. f. mogollonensis*, but size much smaller than the latter Summer pelage. The summer pelage is not represented in the present material, but is probably very nearly like that of *S. f. mogollonensis*. The geographic range is Taos Range Mountains, New Mexico. In coloration *S. f. neomexicanus* very closely resembles *S. f. mogollonensis*, in this respect being much nearer that form than to *S. fremonti*. It is, however, essentially of the same size as *S. fremonti*, and thus much smaller than *S. h. mogollonensis*, with relatively much shorter nasals.

Sciurus fremonti mogollonensis, (Mearns) ARIZONA CHICKAREE. Winter pelage similar to *S. fremonti*, except that the median dorsal band is of a brighter, stronger tint of yellowish rufous. Tail and lower parts similar. Summer pelage similar in all respects to *S. fremonti* except that the rufous suffusion of the upper parts is much brighter and stronger. The geographic range is the higher mountains and plateaus of Central Arizona, from the Douglas fir belt to the timber line.

Sciurus fremonti grahamensis (Allen) MOUNT GRAHAM CHICKAREE. Summer pelage differing from that of *S f. mogollonensis* in being yellower and less rufescent above, with the central area of the tail ochraceous above and nearly white below. The winter pelage is not represented. Geographic range is the fir zone on the summit of Mt. Graham, Arizona. *S. fremonti grahamensis* is very closely related to *S. f. mogollonensis*, from which, however, it seems to be easily separable, as stated above, so far at least as present material is concerned. The two forms, moreover, are geographically well isolated.

REVIEW OF THE SCIURUS FREMONTI GROUP.

The *Sciurus fremonti* group is sharply differentiated from the *S hudsonicus* group, although separated at several points by only a slight geographical interval. *S fremonti* proper is found apparently throughout the mountains of Colorado, ranging northward to the northern extremity of the Medicine Bow Range, which extends a few miles over the Wyoming border. In the Laramie Mountains, the next range to the northeastward, and only a few miles distant, is found the entirely distinct and very different *S. h. baileyi*. The Chickaree found at Wood's P. O. in the Medicine Bow Mountains is true *S. fremonti*, while the Chickaree from the southern end of the Laramie Mountains, less than thirty miles to the eastward, is a pale phase of *S. h. baileyi*.

Typical *S. fremonti* is represented in the present material by specimens from several points in the Uintah Mountains, including the vicinity of Fort Bridger, Wyoming, while from the Bear River and Wasatch Mountains, only thirty to fifty miles to the westward of points where *S. fremonti* occurs, *S. h. ventorum* is the only Chickaree represented in the material now in hand. In neither case is there apparent any evidence of intergradation.

In southern Colorado true *S. fremonti* grades toward what is here called *S. f. neomexicanus*, a phase which in coloration is hardly separable from *S. mogollonensis*. At present our knowledge of the distribution of the Chickarees in Colorado and New Mexico is very limited. A single winter specimen from Chama, New Mexico, almost on the Colorado boundary, seems referable to true *fremonti*, but all the specimens from the eastern slope of the Taos Mountains in Colfax and Mora counties, New Mexico, are very different from specimens from central and northern Colorado.

S. f. mogollonensis differs from *S, fremonti* in its much brighter and more yellowish dorsal region in both pelages, and also in its larger size, especially as shown by the skull meas-

urements, and in the relatively greater length of the nasals. *S. f. neomexicanus* agrees in size and in the relative length of the nasals with *S. fremonti*, but with *S. f. mogollonensis* in coloration.

The species most nearly related to *S. fremonti* is *S. douglasii*, as represented in *S. d. californicus*, where the resemblance is often so close in winter specimens, that their separation without reference to the localities would be exceedingly difficult, yet the same individuals in summer pelage would differ so markedly in the coloration of the ventral surface as to leave not the slightest doubt as to their true relationships. In *S. fremonti*, *S. f. mogollonensis* and *S. d. californicus* the tail is conspicuously fringed with white, in contrast with the yellow fringed tail of true *S. douglasii* and of all the members of the *S. hudsonicus* group.

Notes on the Jack Rabbits of the United States.*

All the rabbits of the United States belong to the cosmopolitan genus *Lepus*, but they have been arranged for convenience in several groups or subgenera. Of these groups the subgenus Macrotolagus, (Black-tailed Jack Rabbits) is characterized by certain peculiarities of the skull, by having ears longer than hind foot and pelage which never turns white. For convenience, the Jack Rabbits which occur in the United States may be divided into two groups, according to the color of the upper surface of the tail. (Jack Rabbits never turn the tail up like cotton-tails, and hence it is easy to tell at a distance whether the color of the upper surface is black or white.) In the first group, represented, by the Prairie Hare (*Lepus campestris*)—the only Jack Rabbit which ever turns white in winter—the tail is entirely white. In the second group (*Macrotolagus*) the upper surface of the tail is marked by a more or less distinct stripe of black. Several species of this group have been described, as will appear later.

Prairie Hare or White-tailed Jack Rabbit (*Lepus campestris*, Bachman). It was first discovered by Lewis and Clark on their memorable trip across the continent in 1804-6, although not actually named until 1837. Bachman's description was as follows: "The hare on this side of the Rocky Mountains inhabits the great plains of the Columbia. Eastward of those mountains, they inhabit the plains of the Missouri. They weigh 7 to 11 pounds. The head, neck, back shoulder, thighs and outer part of the legs are of a lead color; the sides as they approach the belly, become gradually more white; the belly, breast and inner parts of the legs and thighs are white, with a light shade of lead color; the tail is round and bluntly pointed, covered with white, soft, fine fur, not quite so long as on other parts of the body; the body is covered with a deep, fine, soft close fur. The colors here described are those which the animal assumes from the middle of April to the middle of November; the rest of the year he is pure white, except the black and reddish brown of the ears, which never change. A few reddish brown spots are sometimes intermixed with the white at this season (February) on the head and the upper part of the neck and shoulders. His food is grass and herbs; in winter he feeds much on the bark of several aromatic herbs growing on the plains. Captain Lewis measured the leaps of his animal, and found them commonly 18 to 21 feet. They are generally found separate and are never seen to associate in greater numbers than two or three."

The white-tailed Jack Rabbit has an extended range in the northern part of the Great Basin and on the Great Plains. It is said to be found as far north as latitude 55 degrees in Sas-

* Compiled from Dr. T. S. Palmer's report to the Biological Survey of the Department of Agriculture of the United States, 1897

katchewan,and ranges eastward toLake Winnipeg, Lanesboro, Minnesota and central Iowa. On the south it is not found on the plains much below central Kansas and southern Colorado, Fort Riley and Pendennis, Kans., and Las Animas, Colo., being near its southern limits. On the Rocky Mountain Plateau, however, it goes a little further south and has been taken at Ft. Garland, Colo , and at Kanao, Utah The Sierra Nevada and Cascade Range mark the limits of its western distribution, but it occurs in the Sierra, as far south as Hope Valley. Although called the Prairie Hare it ranges high up in the mountains, at least in summer, higher than any other Jack Rabbit.

In August, 1891, I saw a large rabbit belonging to his species, at an altitude of about 10,000 feet in the Sierra Nevada, about 20 miles south of Mt. Whitney. Signs of their presence have been found in the Rocky Mountains far above timber line and nearly to the summits of the higher peaks. It is hardly probable that Jack Rabbits spend the winter at such altitudes, but the upper limit of their winter range remains to be determined. Abundant food in the mountain meadows and above timber line probably tempts them to ascend from lower levels in summer, just as cultivated fields on the plains attract them from a distance.

In the mountains and in the northern part of their range they become pure white in winter, but in Kansas, Neb., Washington and elsewhere near the southern limit of their habitat they undergo only a partial change, or do not turn white at all. In southern Oregon the rabbits inhabiting the higher mountains are said to turn white in winter, while a little lower down they undergo only a partial change and in the valleys do not assume the white pelage.

Opinions seem to differ as to the abundance of the Prairie Hare. Dr. A. K. Fisher has seen as many as 20 together near Colby, Kan., and farther north it is killed in large quantities for market. A commission house in St. Paul, Minnesota, reports having handled 12,000 Jack Rabbits during the winter of 1894-5, most of which came from North and South Dakota, where this is the only species. Several thousand are estimated to have been killed in Codington County, S. D , alone, during the same season. Certainly it must be tolerably abundant in these states to be obtained in such numbers.

The fur of the Prairie Hare is long and silky, and exactly the color of the sand and the dead leaves under the bushes, where they make their "forms." Unless they move, it is impossible to distinguish them, although looking down on their backs. But when once started they are off in an instant, and their characteristic actions at such times are thus described by Dr. Coues:

"The extraordinary agility of this animal, which would be inferred from inspection of its lithe yet muscular and free-limbed shape, has always attracted attention. The first sign one has usually of a hare which has squatted low in hopes of concealment, till its fears force it to fly, is a great bound into the air, with lengthened body and erect ears. The instant it touches the ground it is up again, with a peculiar springy jerk, more like the rebounding of an elastic ball than the result of muscular exertion. It does not come fairly down, and gather itself for the next spring, but seems to hold its legs stiffly extended, to touch only its toes, and rebound by the force of its impact. The action is strikingly suggestive of the "bucking" of a mule, an affair with which people of the west are only too familiar. With a succession of these high jerky leaps the animal makes off generally in a straight course; there is nothing of the dodging or scuttling about, that marks the running of the smaller rabbits. As it gains on its pursuers, and its ears subsides, the springs grow weaker, just as a flat

stone "skipped" on the water diminishes in length of the rebounds, and finally the animal squats in its tracks on its haunches with a jerk, to look and listen. The attitude as such times is highly characteristic. One fore foot is advanced a little before the other, and the ears are held pointing in opposite directions. A hare in such an attitude as this is always upon the watch, and the slightest stimulation of its fears at such a time is enough to start it on its bounding course. It is a beautiful exhibition of timid watchfulness. I have never seen this hare stand erect with its fore paws off the ground, as some of the smaller relatives are wont to do, and I doubt that it ever assumes this attitude except perhaps momentarily.

(To be continued.)

Directions and Suggestions.

WHERE TO FIND AND HOW TO COLLECT AND PREPARE LAND AND FRESH WATER SHELLS FOR THE CABINET.

General remarks.—With the results of his labor before him the collector derives much information respecting his shells as will enhance the pleasure and other advantages he expects to derive from them. To the true naturalist they are the most beautiful as nature made them, and one should never seek to beautify them by varnishing. If you wish to exchange your duplicates with other collectors we would not advise any artificial treatment other than judicious cleaning.

In arranging a series of shells in a cabinet, the collector, if unacquainted with their names, may group the species according to their obvious resemblances that show their relation to each other. We strongly recommend keeping a note book and as fast as one puts shells in the cabinet, whether named or not, to designate them by number, said number referring to a similar one in the note book, where full details of the take, date, etc., should be recorded.

In packing the large Fresh Water Mussels, if a quantity are to be sent, they may be nested one inside another and then wrapped in paper and placed in tiers in a strong box. Use straw, moss or any soft material between the layers and at bottom and top. They may be safely sent by freight. Bill as Clam Shells and they will go at a specially low rate.

The smaller land and fresh water shells can be neatly packed in small pasteboard boxes and these in turn put in cigar boxes when they may be sent to most any part of the world by mail. Cotton or other soft material should be liberally used. Tissue paper is best for wrapping. Always brace the cover of cigar boxes so that with rough handling it will not be crushed in. If your package weighs less than three pounds it can be sent to any point in the United States by express at one cent an ounce the same as mail. The minimum charge over one company is 15 cents and if it goes through the hands of two companies the minimum charge is 20 cents. If a package, for instance, weighs 30 ounces the express companies will carry it across the United States for 30 cents. It is a special rate in competition with the mail. It is much safer than by mail and besides the express company guarantees the shipper against loss.

We mention this matter as many express agents do not give their customers this special rate unless asked to do so.

Beginning with January 1, 1899, collectors in the United States have the satisfaction and privilege of shipping samples of their specimens to any point in the Postal Union at one cent an ounce, the regular merchandise rate within the U. S. For many years collectors have been handicapped by being charged 10 cents an ounce, regular letter rate. I believe the limit of weight is 12 ounces, but one may

pack quite a large number of land and fresh water shells in a package weighing 10 ounces and which can now be sent for 10 cents to most any part of the world.

We also advise collectors to post themselves on the special postal regulations with the Central American countries and some of the islands adjacent thereto, which are very favorable to the sending of specimens by mail. We recently sent a shipment of material weighing 100 pounds by mail ro Central America at a cheaper rate than it would have cost by freight.

As stated at the beginning of these remarks the writer will be glad to identify specimens where possible and to aid collectors with information in any way possible. Always enclose stamp for reply when writing for information and in sending shells for names always collect live specimens and remove the soft parts, etc , before sending. Do not send dead specimens found on the shore or beach, unless no others can be found.

We hope these directions may be the means of starting many collectors to studying the shells to be found about them. The number of species of land and fresh water shells in the United States is enormous and well worth your study. It will be found quite as fascinating as collecting in any other branch of natural history.

WALTER F. WEBB,
Albion, N. Y.

Hunting Abalones.

From an exchange we clip an interesting note as to the manner the California Abalones are secured by the Chinese.

"The Santa Catalina Islands are the headquarters for this industry, the methods of which were observed by the writer at San Clemente. A crude, high-pooped junk, with a big eye forward, was the source of supply, and had landed a band of ten men on the island, which. is forty or more miles from San Pedro. She had deposited another band at San Nicolas, sixty miles distant, and was now running between these islands and the mainland, providing the men with provisions and carrying the shells to the coast. The men were in camp on a little bay, and near by were a great many sacks of abalones ready for shipment. Every morning the hunters started out, some armed with a long pole, on the end of which was an implement like a chisel, intended for prying off the shells from the rocks. The majority of abalones are found just below tide water, some in water ten feet deep, and in a sea way they are difficult to secure. The men are sometimes bruised by being thrown against the rocks, and an occasional death by drowning has been known. Boats working in a heavy sea are often hurled upon the rocks and the men injured.

"The shells when found are relieved of their meat, the latter being dried and sold in the local Chinatown, or shipped to China, where it is considered a delicacy. In the hotels of the California coast abalone chowder is a popular dish. To the uninitiated its preparation is a mystery, as no amount of cooking has any effect upon it until it has been thoroughly pounded with a hammer or hatchet, breaking the leathery muscle, when the meat becomes tender and appetizing.

"The shell itself is in great favor both in this country and Germany. In the latter it is made into cheap jewelry, buttons and various articles, which are reshipped to this country. It is also employed for inlaying furniture and various fancy objects. The dust is utilized, and some of the polished shells are sold as curiosities. In polishing the shells much skill is exercised to produce the best effects in the white, black, red and green markings, especially in the black and silver abalones, the cutter or polisher often producing a perfect cross of black against a surface of white. which shell

finds ready sale, the purchaser often assuming that the cross appeared upon the shell in nature.

"During the last year the record obtained was as follows: San Diego county produced 124,210 pounds of abalone meat and shell, valued at $3-, 234; Los Angeles county, 5,000 pounds, and Monterey county 3,700 pounds. In all about $10,000 is realized for the yearly catch.

"Abalone pearls are found loose in the folds of the animal or attached to the shell. In the latter case they are broken off and sold by the lot. Occasionally perfect pearls are found, which bring a large price; but the imperfect ones sell to tourists and curiosity seekers for small sums."

The Marsh Hawk.

(*Circus hudsonicus.*)

Imagine a bright, sunny day on the marshes. Far upon every side spreads a mighty level of mingled drabs and greens, where the new growths struggle to hide the old. In the distance, upon the one hand, vague, purplish masses, like low-lying clouds, tell where the grand old woods ring that side of the wet lands; turn about, and far away a continuous flashing with flecks of white in ceaseless movement prove that the bosom of the lake is restless even upon so soft a day. Above all, the grand dome of flawless blue, and through the centre of the scene the broad, currentless creek, winding like a silver serpent following its sleepy, lazy way. Such is the home of the Marsh Hawk.

It is a restful picture, but there is wild life about. Here and there in the coarse grass a gleam of water hints of placid pools where the piedbilled grebes travel and go under with an oily movement which scarce creates a ripple. Grave, slate-tinted coots slowly cruise along the borders of the creek, while from the cover well-hidden rails indulge in wheezy merriment and send forth rasping queries as to how things go outside. A blue-wing slips by at quarter speed, for there is no danger now, and an old mallard rises on silent wings and winnows low over the grass to some better pool. He is in no hurry, hence his flight is noiseless.

A redwing blackbird in ebony uniform and glowing epaulets rocks upon a bending stalk and flutes his cheery challenge to the accompaniment of the marsh wren's wee snare drum. A snipe bores off in the eye of the indolent breeze to where dozens of his fellows are feeding, and mellow pipings float from muddy borders and shallows where plover and sandpiper to t or wade at will. Ominous, dark and resolute, a narrow winged peregrine dashes across the view, while all swimming life founders and all wading life seeks cover, for well they know the remorseless freebooter, nor will they reappear until that fearful form is lost in blue distance. And throughout the grass, viewless and unsuspected, stand or crouch the *silent* feathered folk—the short-eared owls, the bitterns, and others that keep solemn vigil ove their own affairs.

Away across the marsh a dark speck appears. It soon resolves itself into a large, brownish bird, whose broad wings ply with easy, measured strokes (it never sails), as it beats the marshes as well-trained setter would work in quest of game. To and fro it veers and tacks, its telescopic eye reading at a glance each riddle of the snarl of grass below, and presently it "cuts down" to seize its favorite prey, an unwary, short-tailed field mouse. The bird comes on, but by some mysterious instinct it appears to know exactly where you are concealed, and it passes that spot beyond the reach of any ordinary gun. Its movements are, so far as you can tell, merely whimsical, as it carefully swings from you, but wait until you know this hawk better and you will learn that nearly every one of its kind will act so.

As the bird swerves you see the warm, rusty color of its lower parts, and as it turns straight away a large white spot upon the upper tail coverts proves beyond possibility of a doubt that the bird in question is a female, or a young specimen of the marsh hawk. Long, pointed wings, long tail, steady flight, with no sailing, the conspicuous white spot, and the habit of beating low over the marshes and meadows, will always identify the female and young of this species.

The male in full adult plumage bears so scant a resemblance to his mate that few ordinary sportsmen can identify him. He, as is usual with birds of prey, is somewhat smaller than the female. Seen at a distance he might readily be mistaken for a gull, as the general effect of his plumage is a beautiful, silvery, bluish gray. He if also much slyer than his consort, and seldom affords a chance to the gun.

All too frequently men who should know better endeavor to kill this hawk. It should never be shot. Its food consists of reptiles, locusts, grasshoppers and small mammals, and if it ever attdcks poultry the harm it does is infinitestimal when compared with the valuable service it renders.

The male measures from 17 to 19 inches in length; the female about two inches longer. Its range extends over North America and south to Panama. The nest is built upon the ground in marshes and meadows and contains four or five whitish eggs, which sometimes show irregular brownish markings This hawk is said to fly at night, but this I have never observed.—Ed. W. Sandys in *Outing* for May.

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Scaled Quail, 1 12	25
Mexican crested Flycatcher, 1-5	10
Golden-fronted Woodpecker, 1-6	11
Black throated Sparrow, 1-4	12
Red-bill Pigeon, 1-1	25
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Traill's Flycatcher, 1 4	06
Western Bluebird, 1-6	06
America Magpie, 1 5	06
Red-eye Vireo, 1-3	06
Purple Martin, 1-6	07
Orchard Oriole, 1-5	04
Bush Tit, 1-5	10
Canvas-back Duck, 1-4	30
Palmer's Thrasher, 1-3	35
Brewer's Sparrow, 1-3	12
Hooded Warbler, 1-3	18
Swamp Sparrow, 1-4	10
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Chestnut sided Warbler, 1-4	12
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Red wing Blackbird, 1-4	02
Tricolored Blackbird, 1-4	06
California Thrasher, 1-3	10
California Towhee, 1-4	05
Brown Thrasher, 1 3, 1-4	02
Baltimore Oriole, 1-5	04
Mockingbird, 1 4	03
Catbird, 1-4	02
Sennett's Thrasher, 1-4	07
Snapping Turtle, 1-25	04
Bluebird, 1-4	03
Flicker, 1-7	03
Indigo Bunting, 1-4	06
Florida Gallinule, 1-7	06
Kingbird, 1-4	04
California Murre, 1 1	10
Clapper Rail, 1-8	10
Ground Dove, 1-2	10
Pied-bill Grebe, 1-6	05
Horned Grebe, 1-6	08
Red leg Turtle, 1 8	05
Leache's Petrel, 1-1	10
Red eye Cowbird, 1-1	10
Dwarf Cowbird, 1-1	00
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W. F. WEBB, Albion, N. Y.

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Scissor-tailed Flycatcher	30

Cracked Ostrich Eggs.

In the handling of over 100 dozen Ostrich eggs we found a great many specimens cracked slightly. Some you would have to hunt quite a while to find the imperfection They are just the same as we have been selling for one year, only for the cracks. Per dozen $2 00 Single specimen net 20c or prepaid 45c. Perfect Ostrich eggs are now worth $6 00 a dozen.

Indian Relics and Curios.

Fine Perfect Pottery Pipe	$4 00
" " Bowl	4 00
" Bowl, cracked	2.50
Good Celt	.40
Sinkers	15
Scrapers, notched or unnotched	.15
Points, poor, various states	01
" better, " "	.03
" good to fine, various states	.10
" fine	.20
Chautauqua shell collection, used to sell at $2.50, prepaid, have 10 will sell at	1.25
Cactus Wood Cane	.50
Collection of 50 kinds of minerals, all named etc	.75
Special rates on 25 to 50 collections.	
Ostrich Egg, African	.85
A bargain on some big Bahama Corals weighing 10 to 40 pounds each.	
Marine algae per doz cards	.75
Scorpion, mounted in box	.40
Hermet Crab, in shell; all in box	.25
Piece of Big Tree Bark, 4 x 4 inch	.20
12 kinds of Sea Beans, all named, for	.30
25 kinds of Foreign Birds' eggs, all named and first class, for	1.50
Birds of Labrador Natural History of Labrador, and O & O. Manual, all for	1.00
Book of Sea Mosses. 10 beautiful cards all different, arranged in a book and tied with ribbon The finest work in the mounting of sea mosses we have ever seen	.60
Ditto, large size, fine	1.20
Marine Algea Blotter, the top card with beautiful mountings and covered with celluloid. Very neat	.40
Marine Algea Newspaper Clipping Case, 6 large envelopes appropriately named and bound in heavy covers, on which are beautiful mounts under celluloid, so it is not easily soiled, gold edges	.75
Marine Algea Panel, consisting of 5 card mounts, strung with ribbon, so as to hang on wall This is to our notion one of the handsomest	.40
Marine Algea Photo. Frame. The frame proper is covered with beautiful mounts that are in turn covered with celluloid to keep dust from soiling. Has back, so will stand on mantel or table. A beauty	.60
Shell Case, a pair of Peeten irridans, hinged at bottom in which are 10 cards of algea, very neat	.40

The above seven articles are particularly suitable for birthday or wedding gifts, being something that will be always admired. We will send on approval to any collectors, so sure are we that you will be more than pleased.

Minerals.

We carry quite an extensive stock of minerals for one who does not pretend to make it a specialty. We can always furnish several hundred kinds right from our cabinet draws, and are glad to send on approval to any one who wishes to start a cabinet.

The following kinds are sure to be in stock, and good cabinet specimens will be sent for 5c each prepaid. A much finer grade such as run 2 by 2 to 2 by 3 for 10c each

The following fine minerals are all in stock. We will send good size cabinet specimens for 5 cents each, prepaid:

Argentite, Allanite, Arsenopyrite, Atacomite, Agate, Asbestos, Albite, Actinolite, Amphibole, Apatite, Anhydrite, Alabaster, Biotite, Beryl, Bog Iron Ore, Bauxite, Bloodstone, Buhrstone, Bornite, Copper Psend, Chrysalite, Chalcopyrite, Cerrusite, Cryolite, Cerargyrite, Chalcedony, Carnelian, Chert, Corundum, Cuprite, Calcite, Calcite Crystal, Chalk, Calc. Tufa, Crocidolite, Cookerite, Celestite, Drusy Quartz, Dolomite, Elaelolite, Electric Stone Epidote Feldspar Franklinite, Gypsum, Graphite, Glauconite, Genthite, Garnet, Galena, Gold Ore, Galenite, Heulandite, Halite, Iolite, Idocrase, Jasper, Kaolinite, Lazurite, Lepidolite, Labradorite, Leelite, Litho Stone, Lava, Limonite, Lignite, Leucite, Lollingite, Molybdenite, Marmolite, Magnetite, Magnesite, Monazite, Natron, Nuttallite, Native Copper, Orpiment, Opal Wood, Opal, Onyx, Oolite, Prehnite, Pisolite, Pearl Spar, Proustite, Pyroxene, Porcelainite, Pyrrhotite, Pyrites, Petrified Wood, Pectotite, Psilomelane, Quartz, Realger, Rhodonite, Rock Crystal, Rose Quartz, Rutile, Rutile in Quartz, Rhombspar, Rhodocrosite, Ripidolite, Satin Spar, Selenite, Selenite Crystal, Somarskite, Sepiolite, Sillimanite, Sodalite, Simithsonite, Siderite, Smoky Quartz, Spodumene, Sphalerite, Stibnite, Strontianite, Stilbite, Stinkstone, Sulphur Turquois, Titanite, Thompsonite, Thulite, Uranite, Ulexite, Ullmanite, Vivianite Vesuvianite, Wad, Wernerite, Williamsite, Zungite, Zircon xl

Modern Beaded Indian Relics.

1 fine beaded bag	.60
1 beaded glass and can each	.30
2 beaded bottles	.30
1 squaw belt, with metal plates on	3.00
3 war clubs, assorted, all kinds	1.50
2 pairs of moccasins, assorted	1.50
2 fine pipes of peace with handles	1.50
1 pair armlets	.50
1 beaded bag	.60
1 fine beaded war club	2.25

Indian Iron Tomahawks.

We were recently very fortunate in securing one of these rare relics. It is in fine state of preservation, notwithstanding of iron and must have lain in the ground for a long period. Price $3.50.

California Condor Egg.

We have a perfect egg of this very rare bird taken this year. The egg was absolutely fresh, and presents characteristics in way of freshness that no incubated egg ever shows. We offer it at a reasonable cash figure, or will consider offer of part cash and part exchange, where the exchange part of the deal is desirable material. There can be no question as to this specimen giving the utmost satisfaction to the most fastidious collector.

Alcoholic Specimens.

We will send any of these specimens by mail prepaid. Customers can put them in jars to suit themselves. They are all nice specimens. We give localities

Water snake, N. Y.	$ .25
Common toad, N. Y.	.25
Spade-foot toad, N. Y.	35
Green frog, N. Y.	.20
Pink crab, Atlantic	.25
Spider crab, Atlantic	25
Sea Anemones Atlantic	.25
Marine algea small jar, sev. kinds	.25
Grass snake, N. Y.	.25
Milk snake, N. Y.	35
Atlantic starfish, Atlantic	.20
"Polywogs" 1 inch, N. Y.	.10
Helix, inflated, several species	.15
Sea urchin, Atlantic	25
Shrimp Atlantic	.25
Section of sponge, Atlantic	.15
Lamp shell, brachiapod, Atlantic	.25
Tree frog, N. C.	.20
Swamp tree frog, Raleigh, N. C.	25
Cricket frog Mississippi	.20
Toothless frog, N. C.	25
Spring frog N. C.	.20
Leopard frog, N. C.	.20
Pickeral frog, N. C.	.30

Fine Shells.

We wish to state here that of American shells we have on hand two species of Io, 8 species of Angitrema, 4 species of Lithasia, 6 species of Strepobasis, 50 kinds of Trypanostoma, 125 species of Goniobasis, 12 kinds of Schizostoma, 4 kinds of Eurycaelon, 18 kinds of Anculosa, 4 kinds of Vivipara, 2 kinds of Lioplax, 11 kinds of Melantho, 6 kinds of Somatogyrus, 16 kinds Physa, 12 kinds of Limnaea, besides various species of Pomatiopsis, Flumnicola, Ancylus, Amnicola, Zua, Bulinus, Tulotoma, Planorois, etc. We will sell any of the above fine samples at 10c per pair, or 5c per specimen. While this may seem a high figure for some, still there are others that one would spend $5 to try and get a few specimens and maybe not procure over a dozen. In other words some we offer above are worth many times 5c each. We will give a discount of 25 per cent. on above prices for orders of $10 and upwards, prompt cash.

In American land shells we have about 100 kinds all correctly labelled and localized. We will make up nice assortments and send on approval, to any interested collectors at very low prices.

In Foreign land and fresh water shells we've about 500 kinds at least and possibly nearer one thousand. Nice assortments of Helix, Achatinella, Partula, Helicina, Bulimus, Helix, Vivipara, etc. etc from all parts of the world.

In Marine shells we have probably 2,000 kinds on hand and shall take great pleasure in sending collectors named and priced assortments from which they may select any they wish. Our rules in such cases are that collectors are to pay charges on box sent, where by express and we agree to pay on any returned. If we send the package by mail, the customer is to return any not wanted in like manner.

All shells are priced very low, much below catalogue prices of regular dealers and we feel sure we can please you as to quality. We invite collectors to send us l sts of what they collect in American Land and Fresh Water Shells and if agreeable to exchange we may be able to offer you something for your duplicates that will be very acceptable. Of many fine foreign shells, we have a great quantity, more than we hope to sell in years and we very naturally would like to exchange some of them for other kinds that we do not have, or that our stock is very low on.

Collections.

The Young Naturalist's Marvelous collection, consists of 44 specimens, as follows: Indian Pottery, Yellow Red and Black Sea Beans, Chinese Horn Nut, Egg Capsule Periwinkle, Sand Box Shuck, Alligator Tooth, Tarpon Scale, Jobs Tears, Black eye Susans, Miamosa Seeds, Castor Oil Bean, Foreign Land Snail, Bleeding Tooth, Ring Top Cowry, Money Cowry, Tectarias, Olive, Worm Shell, American Fresh Water Shell, American Land Shell, Purpura, Limpet, Beehive Shell, Drill Shell, Button Shell, Satin Spar, Petrified Wood, Mexican Onyx, Petrified Coral, Petrified Nautilus, Petrified Shell, W. I. Branch Coral, E. I. Branch Coral, Yellow Coral, Organpipe Coral, Prescious Coral, Coralline, Yellow Sea Fan, Purple Sea Fern, Sponge, Starfish, Sand Dollar.

These are all Natural History Specimens and will delight the young and old as well. They are almost certain to create in any young mind a love for Natural History. Special prices to Teachers, where ordered in quantity for students. We send the collection prepaid with descriptive list of same, for only 60c.

Special Mineral Collection, consisting of 50 specimens of good size, as follows: Actinolite, Albite, Alabaster, Allanite, Aragonite, Arsenopyrite, Asphaltum, Asbestos, Biotite, Beryl, Boltonite, Crystalized Calcite, Chalcedony, Chiastolite Crystal, Cone in Cone, Coquina, Crinoidal Limestone, Dolomite, Flint, Fossil Coral, Garnets in Rock, Geode Quartz, Gold Ore, Graphite, Gypsum, Hematite, Iceland Spar, Iron Pyrites, Kaolin, Lead Ore, Limonite, Marble, Magnetite, Mexican Onyx, Milky Quartz, Mica Schist, Nuttallite, Orthoclase, Petrified Wood, Porcelainite, Psilomelane, Pyrolusite, Pyrrhotite, Pyroxene, Satin Spar, Selenite, Silver Ore, Talc, Tourmaline, Wernerite.

These are all numbered to correspond with a list giving localities, etc. Special rates in quantity. Prepaid for 75c

Audubon Plate. We have one of Audubon's Plates of the Iceland Gryfalcon, nicely framed under glass. It is a beautiful thing for a library. Original price $25. Our special price, strictly net, $10.

Pearl Shell Novelties.

In connection with our extensive handling of both Scientific and Commercial Shells we have decided to offer our customers some beautiful Pearl novelties. They fairly baffle description so brilliant are the colors. The main shells used are Turbo marmoratus and Mother of Pearl. The former blending all shades of green and pearl and the latter both light and dark pearl. The articles are nearly all *useful*. To those who could use 6 to 12 of a kind, we will quote wholesale rates, but the margins are very small, pearl being a hard substance to cut. All specimens are most beautifully polished, so we omit this fact in the descriptions.

1	A large brilliant blue abilone shell, with a clock set in top. A good timepiece	$2 50
546	Ditto with call bell instead of clock	2 00
380	Inkstand composed of a large leaf of Pearl with well set in middle, fine mountings	90
214	Ditto, a horse shoe of Pearl with well in center	55
378	Ditto, M. O. Pearl carved with well in center	.90
379	Same as 378 but with alligator carved on top of shell	1 10
7	Same as 378 with a fine carved fish on top very choice	2 00
8	Napkin ring carved and perforated, green and pearl	25
414	Ditto, carved moon and face	25
9	Ditto, pluk made from Turbo sarmaticus	25
a81	Ditto, carved gator and leaf	30
a76	Ditto, carved Indian head, fine	30
a74	Ditto, plain green and pearl	20
198	Pin tray, all pearl notched top, 3 inch	30
	Same thing, 4 inch	40
126	Ditto, large Turbo mounted on stand	70
425	Ditto, 3 inch top with gator carved on same	70
413	Ditto, 3 inch top with knob handle	65
409	Ditto, decorated top	35
598	Ditto, whole top carved into Indian head	1 00
526	Ditto, 3½ inches with solid handle, all 1 shell	65
548	Ditto, larger pattern	80
530	Ditto, still larger pattern	1 00
4g	Ditto, 3½ inch with carved perforated gator on top	1 25
395	Ditto, with carved perforated leaf design	65
164	Ditto, 3 inches plain	25
517	Ditto, 2 inches plain	20
197	Pearl blotter with nickle knobs	75
141	Ditto, pearl top and pearl handle	1 00
431	Ditto green pearl top and pearl handle	1 00
439	Ditto, carved green and pearl turtle with pearl handle	1 25
138	Pearl paper knife	25
137	Ditto, carved handle	30
144	Gold and pearl penholder and pen	50
425	Pearl and glass double individual salt cellar	30
431	Ditto, with Indian head carved on bottom	35
564	Cowry and pearl pin tray, curious	25

30 styles and sizes of Pearl Spoons and Forks.

200	Fish design, metal handle, 5 inch	30
199	Carved bowl, 5 inch	30
200	Fork, 4 prong, 5 inches	30
372	Carved bowl, 5 inches	25
78	Fish bowl, 8 inches	35
76	Large bowl, 8 inches	35
498	Metal bowl, M. O. pearl handle with Indian head on top, 5 inches	30
500	Pearl bowl, metal handle, 5 inch	30
386	Pearl bowl, fancy handle	30
369	Pearl bowl and handle	35
362	M. O. pearl bowl, metal handle, 9 inch large	40
135	Pearl plain bowl, 9 inches	40
135	Ditto, fork	40
348	Pearl bowl, M. O. Pearl handle	50
375	Deep pearl bowl and handle, dainty, 5 inches	50
372	Ditto carved	50
366	Ditto carved Indian fish bowl	50
368	Ditto, carved fish bowl	50
566	10 inch solid spoon, pearl fish design bowl	65
359	Ditto, fork	60
357	8 inch pearl bowl and handle lined pattern	75
356	Ditto, acorn pattern bowl	75
358	Ditto, fish pattern bowl	75
348	Ditto, ribbed handles	75
358½	Pearl fork and handle	74
352	M. O. pearl spoon with gator carved on end of handle	80
350	Pearl leaf bowl	80
353	Pearl leaf handle	80

These are the handsomest pearl goods you ever saw and will last for years. They are the very daintiest thing for the table and mantel. Satisfaction guaranteed. All prepaid at above prices.

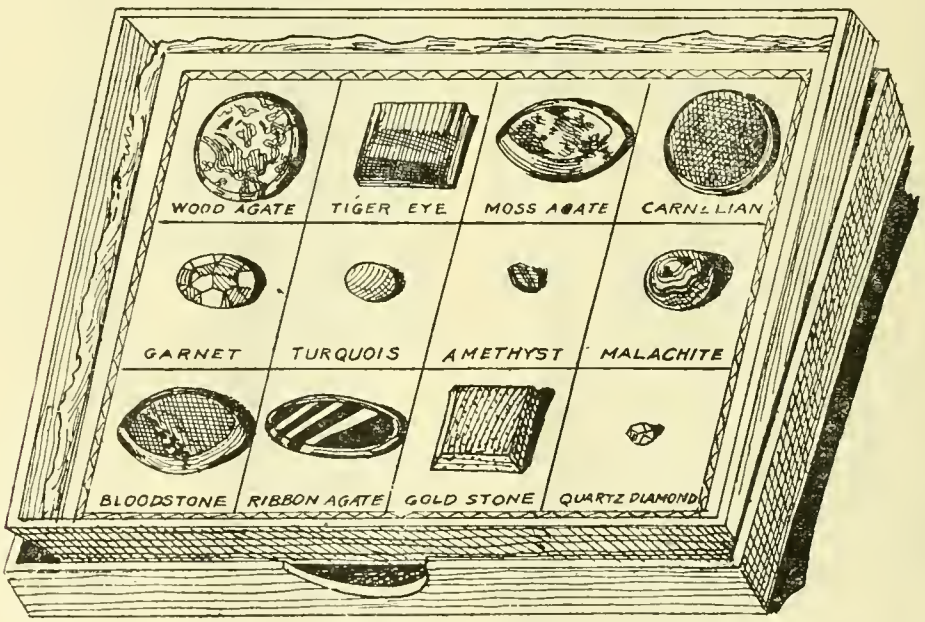
INDIAN RELICS.

Have you any specimens from Arkansas in your collection?
They are very desirable from this territory, and will make your collection quite interesting Wish to say that I am prepared to supply you with any number of nice specimens of fine workmanship, rare shapes and sizes, and made of many different kinds of stone. While my supply is mostly from Arkansas, I have specimens from other sections, which I am sure will please you. Let me send you a list with outlines, or let me know just what you want. My prices are exceedingly cheap.

HOT SPRINGS QUARTZ CRYSTALS.

Are also in stock both in clusters and single, and I would be pleased to furnish every collector an exceedingly nice lot of these choice minerals While I am flush in these at present, I also have fine specimens of other interesting minerals from this state, and a few other sections, and what I have I will sell cheap Let me send you a list of what I have with prices and I am sure you will buy, from me. Let me hear from all. Address,

L. E. MOORE, Moorefield Ark.



50c. Our Gem Collection, 50c.

We present this month a small drawing of our gem collection which, in a crude way, gives collectors an idea how it looks. As the stones are all finely cut and polished, they present a brilliant effect, which cannot fail to attract great attention in a cabinet. These 12 stones could not be bought of any dealer in gems for less than $3 00 to $5 00. and to take the rough stones to a lapidary and have them cut, would cost twice this figure. We believe every collector will want one of these collections. The price is only 50c. They will sell at $1.00 just as easily. Many years ago a Rocky Mountain dealer in minerals offered such a collection at $1.00. They were considered a wonderful lot for the price. In fact, it is a mystery to every one how the stones can be cut and polished and sold for any such figure as we offer. We confess we do not understand how it is done, unless the parties who do the work are laborers who receive but a few pennies a day for their labor. Send a dollar bill well wrapped in your letter for two collections, sell one of them to a friend in your place who will be interested in cut stones, for $1.00 and you have yours free. We guarantee that if they are shown to a few friends they will readily sell at $1 00. If you succeed in selling one, as we are sure you will and think there will be a demand for more, we will make you a figure on a dozen. Let us hear from you at once.

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We have every facility for furnishing collectors or dealers with Florida Shells, or Souvenirs. We have had long experience in collecting, and the Editor of the MUSEUM, has, unsolicited by us, offered to answer any inquiries as to our responsibility or fair dealing. If you wish to see quality of specimens before placing larger orders, send $1 for a box of samples. All cleaned and correctly named. Price list for stamp and all inquiries promptly answered. Give us a trial.

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Florida Land and Fresh Water Shells. Also Centipedes, Scorpions, Crabs, etc. in alcohol at a bargain. Address with stamp.

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Wholesale Bargains.

We have on hand many fine things in such quantity we quote low rates on wholesale orders, in order to make room. The material offered in every instance is as low as money can buy. Look over the list carefully:

Purple Sea Plumes from the Bahamas. Large size, 4 to 5 feet, $2.50 per dozen. Medium, 2 to 3 feet, $1 50 per dozen.

Ostrich Eggs, South African specimens, at $6 00 per dozen.

Cypræa Annulus, Ringtop Cowries, from the East Indies, 50 cents per quart.

Cypræa moneta, with varieties, Money Cowry from Singapore, 50 cents per quart.

Black Haliotis, 4 to 5 inch, from Monterey, Cal. 75 cents per dozen.

Red Haliotis, from Monterey, 7 to 10 inch, at $1.50 per dozen.

Strombus tuberculatus Silver Lips, 2 inch, from Singapore, at 36 cents per dozen.

Strombus alatus, Purple Mouth, from Fla., at 24 cents dozen.

E. I. Coral fragments, 2 to 3 inch, 20c dozen

Melongena corona, Crown Shell, from Fla., 24c doz.

Sabre Beans, mammoth, 16 to 20 inches, curious, Bahamas, at 50c doz.

Nereta peleronta, Bleeding Teeth, Bahamas, at 50 cents quart.

Purple Gorgonias, Flexible Coral from Bahamas. $1 50 dozen

Mica Snow, for Taxidermists and fancy work, worth 80c pound, our price 20c.

Murex brandaris, from East Indies, 1 to 2 inch, 15c dozen.

Bahama Coral, such as Fan, Head, Palm, etc. Several species at 10c pound.

Mineral Collections, for Teachers to give or sell to students, 50 varieties, named, etc., at 50c lists on application.

Mixed Shells, from Bahamas, nice for fancy work, 25c quart

Fasciolaria distans, Tulip, 2 inch, 36c dozen.

Fasciolaria tulipi, Tulip, 3 to 4 inch, 40c doz.

Fulgur perversa, from Fla., 4 to 5 inch, 60c"

Tube Sponges, a great curio from Bahamas, $1.50 dozen.

Scaphites nodosus, an ammonite shaped fossil from the Bad Lands, 2 inch, 50c doz., 3 inch, $1 00 dozen; 4 inch, $3 00 dozen.

Make up your order now, as these prices only hold good while stock lasts.

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VOL. V. NO. 10.

AUGUST, 1899.

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4. PINE GROSBEAK EGGS in sets of 3, 4, 5 with Nests. 75c per egg, nest gratis. 50 sets already sold. References Wm. Brewster, Cambridge, Mass; J. Parker Norris, Jr., Philadelphia and other prominent ornithologists. Do you want a set? Of course you do.
5. SHELLDRAKE GAME PIECES, on polished shield for your dining room. A pair, male and female, 3.00; one, $2.00. Very beautiful.
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COLLECTORS. Have you read our "Wholesale Bargains" elsewhere in this number? If you are familiar with the goods offered you will see at a glance that the prices are way down. W. F. WEBB.

THE MUSEUM.

WANTS, EXCHANGES AND FOR SALES.

All notices that come under above will be inserted in this department until further notice at one (1) cent a word. No notice less than 25c. Terms Cash with order. *No charge for address.* I shall at all times endeavor to keep parties, whose reputation is of a doubtful character from using these columns.

□WANTED.—Old issues of U. S. Adhesive Stamps for which we offer fine California Bird Skins. Address TOWNE BROS., Commonwealth Ave , West Newton, Mass.

WANTED:—Back numbers of papers on Natural Science and books of any kind on Natural History, also bird skins. Can offer good exchange in invertebrates, nice eastern bird skins and some papers on Natural History. State value of material when writing. F P DROWNE, 20 Benefit St , Providence, R I.

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A Monthly Magazine Devoted to Research in Natural Science.

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Walter F. Webb, Editor and Manager

Albion N. Y.

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How to Prepare a Scientific Skin of a Giant Tortoise.

In using the name Giant Tortoise the writer refers to the extremely large and rare tortoise of the Galapagos group west of Ecuador. The following directions for properly preparing a scientific skin of one of these animals will, however, apply with slight variations in different cases, to any member of the Chelonian family.*

First as to the necessary tools. In the Galapagos Island tortoise there is no easily separated division between the plastron or under shell and the carapax or upper shell. Consequently a saw is required and the one best fitted for the purpose is a surgeon's bone saw with an adjustable back. These saws are sharp, strong and thin-bladed, three important requisites for this work. A large skinning knife —a butcher knife is the proper thing —and a cartilage knife are both necessary. A pair of bone snips will be found useful, as also a small pair of scissors; and a scraper, though not really necessary, will greatly hasten the work of cleaning the meat and fat from the inside of the shell and some of the bones. These are all the tools required, though curved scissors and some other luxuries often prove of value. In making up the skin a stout needle and thread will be needed. With these few tools and plenty of perseverance and determination to succeed, the operator may be sure of good results.

We will suppose that a dead specimen of *Testudo*, two or three feet in length, lies before us. Put the animal on its back and using the large skinning knife commence at the middle toe and cut through the skin of the under side of the fore-leg up to the joint where it joins the plastron. Be sure and keep the cut on the inside of the leg all the way up so that it will not show when the animal is mounted. Do the same on the other fore-leg.

Then commencing where this cut meets the plastron and this point should be well underneath, saw through the under shell straight across to the middle point of where the skin of the hind leg joins the plastron. Divide the skin of the hind legs keeping the cut in the middle line of the

* In the large salt water turtles the opening can all be made with the knife. The descriptions given for skinning the legs of the tortoise apply equally well to the flippers of the sea turtles.

under side the same as in the fore-legs. Start on either side and leave a margin of skin an inch in width attached to the plastron, divide the skin from one end to the other. The opening cuts are now all made.

To separate the plastron from the flesh of the body so that it can be lifted up, insert the large knife through the opening in shell and cut boldly along the under side of the plastron. The tissue and ligaments soon give way and the plastron can be lifted up and turned back like the cover of a box, the skin serving as a hinge. Cut out all the vscera and the shoulder girdles and pelvis, which may be thrown away unless wanted for use in some other line. Now comes the most tiresome part of the operation, the skinning of the legs.

With the cartilage knife separate the skin from the meat as far down the leg as possible. The stiffness of the skin, caused by the thick scales on the legs, makes this very difficult but by continual cutting with knife and scissors it can be separated way to the toes. Clean the bones thoroughly, but do not disarticulate them, and cut all adhering bits of meat from the skin. Perform this operation on each of the legs.

The neck bone may now be separated from where it connects with the carapax, and the neck skinned down to the base of the skull. The neck turns inside out quite easily, but care must be taken not to cut through the skin, which on the neck is rather thin. On arriving at the base of the skull remove the brain with the point of the knife, and with both scissors and knife dig the meat out of the main orifices of the skull. The neck vertebrae can be left attached to the skull, or if it makes the work any easier they may be detached and afterwards replaced. In either case they must be cleaned as thoroughly as possible. The tongue can also be removed at this stage of the proceedings or it can be taken out later through the mouth cavity. The eye should be removed later on from the outside. It can be cut and picked out with the handle of the cartilage knife, care being taken not to injure the eyelid.

The tail is skinned in much the same manner as the neck. It should be skinned quite down to the tip, leaving the vertebrae in position, but cleaning them thoroughly. The scraper may now be found very useful in cleaning the inside of the skull and the fleshy side of the plastron Should there be any fat or meat adhering to the skin it must be cut away. If the surroundings permit, a wash will facilitate this general cleaning up since it carries away the blood and many loose fragments of flesh. If the skin is now practically free from meat and fat it is ready to poison.

For this purpose use a strong arsenical soap and also plenty of alum. Paint the inside of the skin, the legbones and the vertebrae thoroughly with the soap and give the inside of the shell and the edges of the saw cuts a coat. Sprinkle on the alum, as much as will stick. If you have it to spare, put a little plaster or sawdust in the body cavity to absorb any moisture that may accumulate there. Do not forget to poison the eye cavities. A little of the soap on the outside of the skin does no harm, and if vermin abound may do a great deal of good.

In making up the skin use excelsior to wrap the big bones, etc. If you cannot get excelsior, grass or even paper will do, but do not use hair or any animal substance. Wind each legbone with enough filling to keep the skin from touching it, and also try to imitate the former shape of the leg. Take a few stitches to bring the sides of the cut together. Wind the neck vertebrae and pull the neck right side out. Do the same with the tail and the skin is ready to fold, there being no need of filling in the body cavity.

The most convenient way of folding the skin for transportation is to turn

the plastron back into the body cavity and bend legs, neck and all in on top of it. This makes a very compact bundle for shipment and one not easily broken, while it also has a neat appearance. The label is best attached by passing its string through a small hole in the skin.

Nesting Habits of Some Southern Forms of Birds in Eastern North Carolina.

T. Gilbert Pearson, in the Journal of the Elisha Mitchell Scientific Society.

The coastal region of North Carolina, especially south of Hatteras, having its temperature moderated by warmer ocean currents affords many interesting forms of life both in the fauna and flora whose natural habitat would naturally be looked for at a much more southern point. Thus the palmetto (*Sabal palmetto*) which grows wild to a height of 30 feet on Smith's Island is also found in a more stunted form as far north as the banks of Cape Hatteras. This northward extension of the habitat of some southern birds is somewhat in keeping with that of the flora.

While spending some time in eastern North Carolina during the past summer I observed there some species of southern birds which have hitherto been overlooked by ornithologists as occuring within the limits of this state; and my purpose in publishing the following notes is to record such of these observations as may be of interest.

Worthington's Marsh Wren. (*Cistothorus palustris griseus.*)

The range of this bird as given by Mr. Brewster and later by Frank M. Chapman in his "Handbook of Birds of Eastern North America" is the "Coast of South Carolina and Georgia." In the marsh on Gull Island in Pamlico sound about twenty miles north of Cape Hatteras marsh wrens were found in great numbers on May 20th. The island which is approximately two hundred acres in extent is little more than a continuous salt marsh over the greater part of which the water rises at high storm tides. At the time of my visit the birds were in full song and from every side of the marsh came the notes of scores of birds. While singing the performers usually occupied positions entirely out of sight except as occasionally they would make short flights upward and burst into song as they dropped back again into the cover of the high thick grass.

It was evidently too early in the season for the birds to be breeding for, of the twelve nests found and examined, there were none that contained either eggs or young. The nests were suspended among the grass stalks at distances varying from sixteen to twenty inches above the ground or shallow waters. They were entirely roofed over and varied in form from almost round to elliptical. They were composed of the dead stems and blades of marsh grass neatly wound and woven together while the material was yet damp, thus forming a strong and very durable structure. The entrance was a small opening in the side near the top of the nest.

A specimen taken at this time was identified by Mr. C. S. Brimley, of Raleigh, N. C., as being a Worthington's Marsh Wren.

On June the 9th I heard wrens singing in the marshes near Southport which I took to be of this species, but as no specimens were secured I shall not claim this as a record.

During July and the early part of August wrens were frequently heard in the salt marshes about Beaufort harbor. A visit to some of the marshes on August the 2d resulted in the finding of a few empty nests and securing after much labor a single specimen. Wishing to be certain as to the identification of this the skin was sent to Prof. Ridgway of the Smithsomiam Institution who identified it as being a fair type of *C. p. griseus.*

This race will probably be found subsequently to be a common summer resident in suitable localities along the entire North Carolina coast.

Florida Cormorant, (*Phalacrocorax piliphus fioridanus*). While Florida is the typical home of these Cormorants it has long been known that in the summer they occur along the Atlantic coast as far north as North Carolina. They have not been recorded as breeding in this state, however, as far as I have been able to learn.

Following the course suggested by numerous rumors, I penetrated the forests and swamps of Craven county for a distance of about eighteen miles south of Newbern and found on the 25th of May, a colony of these birds breeding around the shores of Big Lake. The nests were located on the spreading branches of staunted cypress trees standing in the water from fifty to two hundred yards from the shore. Eighteen trees were thus occupied, the number of nests each tree bore varying from one to twelve. In one tree, however, there were thirty-eight occupied nests.

The colony was scattered along the lake side for a distance of a mile and a half. The eggs or young contained in each nest varied from two to four in number. In color the eggs are a pale bluish white overlaid with a more or less soft calcareous coating, and measure about two and a half inches in length by one and a half in width.

The exact measurements in inches and hundredths of two sets of eggs selected at random are here given: A set of four eggs measured 2.50x1.56, 2.53x1.62, 2.47x1.53 and 2.50x1.56. A set of three showed somewhat smaller dimensions, 2.32x1.56, 2.32x1.32 and 2.24x1.53, the average for the seven specimens being 2.42x1.55. Chapman makes no distinction in measurements between the eggs of this variety and the species from which it is derived, giving the measurements of the latter as 2.40x1.40. It is quite possible, however, that measurements taken from a much larger series of eggs of the Carolina bird might show quite a different result from the above.

The young birds were covered with black down, many of them being large enough to leave their nests and climb about on the branches of the trees. In doing this they would often lose their balance on the limbs while endeavoring to escape, but instead of falling into the water the hook at the point of the long bill would invariably catch on the perch and by dint of much scratching the birds would soon regain their former position. So well could they use their bills for climbing that Mr. H. H. Brimley, of Raleigh, N. C., to whom some of these were sent, remarked afterwards in a letter that they repeatedly climbed with apparent ease up the wire netting which composed the sides of their cage.

The food of the Cormorants at this season of the year must consist largely of eels (*Anquilla anquilla*). In nearly every nest signs of eels' remains were seen, the young birds upon becoming excited would disgorge fragments of eels. The old birds which were taken usually had the slime of eels about their heads, necks and bills.

The trees, which contained each a number of nests, were completely covered, trunk, limbs, twigs and nests, with a white coating caused by the fishy excrement of the birds. So white and marked an aspect did the trees present that although they were not usually over twelve or fifteen feet in height their outline could clearly be made out against the dark background of the cypress swamp as we passed in our canoe along the south side of the lake five miles away.

On Jones' mill-pond near Newport, Carteret county, Cormorants were commonly reported to breed, but a search of the region failed to reveal any colony. This location is nevertheless evidently a popular roosting resort. A little before sundown on the day I visited it Cormorants began to come in over the swamp and in a short time

two or three hundred individuals had gathered in the cypress trees along the shores of the pond.

Anhinga, Water Turkey (*Anhinga anhinga*). This is another bird which we may now add to the list of the *avifauna* of North Carolina. It is a bird of a tropical and subtropical America and has been known to breed as far north as South Carolina.

In damming up a stream on the Orton rice plantation in Brunswick county, fifteen miles below Wilmington, a pond was formed which extends back into the woods among the higher ridges for several miles. At the upper end of one of these narrow tongues of water is located a colony of some four of five hundred pairs of Herons, which each year assemble to breed in the cypress trees.

While approaching this heronry on the 7th of June an Anhinga was flushed from its nest in a small cypress tree about ten feet above the water. It flew rapidly away, but soon returned and was secured a few minutes later upon alighting near the nest. It proved to be a male in magnificent plumage. One other bird, also a male, was seen in the neighborhood, but no other nests were noticed. The nest examined was a heavy structure of sticks and twigs, lined with long gray moss (*Tillandsia usneoids*). It contained four eggs well advanced in incubation. In appearance they very much resembled the eggs of the Cormorant, but are smaller, an average egg measuring 1.15x135. In the neighborhood of Lake Wacamaw and the region south and east of there I occasionally heard mention of this bird from the inhabitants and do not doubt but that in suitable localities throughout the south-eastern part of North Carolina the Anhinga is a frequent summer resident.

Notes on the Jack Rabbits of the United States.

(Compiled from Dr. T. S Palmer's report to the Biological survey of the Department of Agriculture of the United States, 1897.

California Jack Rabbit, *Lepus californicus*, Gray. The California Hare is one of the most easily recognized of the Black-tailed Rabbits which inhabit the United States. It is gray above often tinged with brownish and mixed with black; the lower surface of the body and tail is buff. From the tip of the nose to the end of the tail vertebrae it measures about 23¼ inches. The ears vary from 5 to 6 inches, while the tail is only about four inches in length. The only other species which is likely to become confused with it is the Texan Jack Rabbit, which is also found west of the Sierra Nevada, in the San Joaquin Valley. Nowhere in the United States and perhaps nowhere in the world, except in Australia, are rabbits so abundant as in some parts of California, but the published data respecting the distribution of the several species is a good illustration of how much still remains to be learned about even the commonest animals. The California Jack Rabbit was described in 1837, the same year in which the Prairie Hare was named, and the Texan species was first made known in 1848. Although all three of these rabbits have been frequently collected for nearly half a century, and all have been known to occur in California, it is only recently that the limits of their ranges have been accurately determined. In speaking of the California species, T. S. Van Dyke says: "Few animals are more graceful than this Hare, whether skimming the plain before the outstretched greyhound or aroused from its 'form' he dashes away with high jumps, as if to take a better view of the intruder, or stopping and resting upon its hind legs,

stands erect with ears pointed to the zenith and surveys him at a safe distance and again lengthens out his trim form and hugs the ground like a racer until a mile away. Sometimes at early morning or evening you may see him skudding along the plain as if in play, running two or three miles perhaps at high speed. A fine runner he is, too, and gifted with staying qualities. It takes a good greyhound to overtake the best of them, while the slowest of them distance a common dog at every bound."

Black-tailed or Texan Jack Rabbit, *Lepus texianus*. Waterhouse. This hare is pale gray above, often tinged with brownish and mixed with black; the lower surface of the tail and body is white, while the tips of the ears and upper part of the tail are distinctly marked with black. In length it measures about 25½ inches and weighs 4 or 5 lbs. The ears average 6¾ inches, but the tail is only 4¼ inches in length. The Black-tailed Hare is smaller than either the Prairie or Allen's Hare, but is about the same size as the California Jack Rabbit. Specimens from the southern border of the United States are smaller and paler than those found further north and it has recently been proposed to recognize three sub-species or races along the Mexican boundary. They have been named the Western Desert Jack Rabbit, *Lepus texianus desertícola*, Mearns, occurring on the Colorado Desert and eastward to the Sonoyta Valley Arizona; the Desert Hare, *Lepus t. eremicus*, Allen, of Southern Arizona, and the Eastern Desert Jack Rabbit, *Lepus t. griseus* Mearns, ranging from Grant Co , N. M., eastward to Maverick Co.; Texas, and southward in Coabuila and Chibushua. These forms are so closely related to *Lepus texianus* that they need not be considered separately. The Black-tailed Jack Rabbit is found in the Great Basin from the Rocky Mountains west to the Cascade range in Oregon and to the Sierra Nevada in California and from Central Idaho and southeastern Washington south to Mexico. Its range extends eastward into western Texas and some distance down the Rio Grande.

Referring to the habits of the Black-tailed Jack Rabbit in Arizona, Dr. Coues says: "At Fort Whipple the species is very common the year around and almost every sort of locality is frequented by them, though they chiefly affect grass meadows and open glades interspersed with copses or clumps of oak trees or patches of briery undergrowth. The gulches or ‚washes' as they are called, leading out of mountain ravines, and thickly set with greasewood, are favorite resorts. They feed much upon this plant, and by their incessant coursings through patches of it, they wear little intersecting avenues, along which they ramble at their leisure. When feeding at their ease and unsuspicious of danger, they move with a sort of lazy abandom, performing a succession of careless leaps, now nibbling the shrubs overhead, now the grass at their feet. They are not at all gregarious though peculiar attractions may bring them together in the same spot. They do not burrow, but construct a "form" in which they squat. I do not think these are permanent; but rather that they are extemporized, as wanted, in some convenient bush; though the case may be different during the period of reproduction. It has been stated by some authors that only two or three are produced at a birth, which I know to be at least not always the case, having found as many as six embryos in one female. In the attitude of Fort Whipple the young are brought forth in June.

Black-eared Jack Rabbit or Eastern Jackass Hare.

(*Lepus melanotis Mearns.*)

The Black-eared Jack Rabbit was described only seven years ago, in

1890, by Dr. E. A. Mearns, from a market specimen supposed to have been killed near Independence, Kans. The difference between it and the common Black-tailed Jack Rabbit are only apparent after a careful comparison of a series of specimens, but *Lepus melanotis* is described as having a richer coloring and shorter ears than its Western representative. Whether it should be recognized as a full species or merely a subspecies need not be considered here; but it may be explained that under this name are included all the black-tailed jack rabbits occurring east of the Rocky mountains and from northern Texas to Nebraska.

This hare is found on the Great Plains from eastern Kansas to the Rocky Mountains and western Texas, where its range probably merges into that of *Lepus texianus*. In some parts of Kansas and in south-eastern Colorado it is very abundant and is killed in large numbers. When full grown, it weighs about six pounds and is the black-tailed rabbit most commonly seen in the markets of eastern cities.

Its habits are similar to those of other jack rabbits. It is much used in coursing, and is considered one of the best rabbits for this sport. An interesting experiment on its speed was made on the plains of eastern Colorado near Burlington, about 160 miles east of Denver. Several hares were turned loose after having a drop or two of anise-seed oil rubbed on their feet, and as soon as they were out of sight a pack of five hounds was started in pursuit. The first and second hares were run down in about twenty minutes, but the hounds required nearly two hours to overhall the third, "an old black tail." The writer adds that these rabbits run in circles as a rule. They make a spurt for the first two miles, but then begin to weaken, and if the scent is not lost they are certain to be overtaken by the hounds at last.

Allen's Jack Rabbit.

(*Lepus alleni Mearns.*)

Allen's Jack Rabbit is the largest and finest of the hares of the southwest. Even at a distance it may be readily distinguished by its gray sides and the white on the hind part of the body. Its length is about 25¼ inches; tail, 2¾ inches; while the ears measure about 7¾ inches. The color above is yellowish brown mixed with black, but this area is restricted by the gray of the sides, and in autumn (November) specimens is a beautiful dark steel gray. This species was also described by Dr. E. A. Mearns, in 1890, from a specimen collected May 8, 1885, at Rillito Station, on the line of the Southern Pacific Railroad near Tucson, Ariz.

Allen's Hare is found in the deserts of southern Arizona and Sonora, in the region extending from Phœnix south-eastward to the Santa Catalina and Santa Rita mountains, and thence south into Mexico almost as far as Guaymas. It has been collected in Sonora at Oputo, on the upper Yaqui River, at Magdalena, Hermosillo and Ortiz, and probably ranges over the greater part of the state. Little is known as to the western limits of its range or the injury which it may do to crops when the country becomes more thickly settled. Concerning its habits Mr W. W. Price says:

"This splendid hare is abundant about Tucson and in lower portions of the desert belt. It is found both on the gravelly hills bordering the Rillito at Fort Lowell and on the immense mesquite and *Larrea* plains of Tucson. It is somewhat shy, and hard to secure, except with a rifle. One rarely comes upon it suddenly. I have never seen it start up with the quick, rapid flight of *L. texianus*. It has a slow, apparently awkward, gait, but its leaps are long, and it gets over the ground with surprising rapidity. In color and habits it is so very different from any other American hare, the wonder is that it should have so long remained undescribed."

Rio Grande Jack Rabbit.

(Lepus merriami Mearns.)

The Rio Grand Jack Rabbit is most closely related to the Mexican Jack Rabbit (*Lepus callotis*), but differs from it in having shorter ears, tipped with black instead of white, and the upper surface of the body grayish fawn instead of ochraceous buff. The type specimen of *Lepus merriami* is described as grayish fawn mixed with black above, and with white under fur; nape, base, and tips of ears posteriorly jet black; fringes of the ear white on posterior border, clayey white along anterior border, and black at tip; upper side of the tail and middle of the rump black; outer sides of legs and haunches grayish white, thickly lined with black hairs. Except a clay-colored patch on the throat, the entire undersurface of the body, including the inner sides of legs, is pure white. Length about 22½ inches, tail 3 inches and ears 5½ inches. This rabbit has often been referred to by authors under the names *Lepus callotis* and *L. texianus*, but has only recently been described as a distinct species by Dr. E. A. Mearns from a specimen taken at Fort Clark, Kinney county, Tex., April 6, 1893. The Rio Grande Jack Rabbit can be readily distinguished from the other black-tailed jack rabbits which occur in Texas (*Lepus melanotis* in the north and *Lepus texianus griseus* in the west) by the black patches at the base of the ears and on the nape.

This is the common jack rabbit of southern Texas, being found along the lower gulf coast and up the Rio Grande as far as the mouth of Devils River. It was reported by Dr. Mearns as extremely abundant near the mouth of Devils River, and Mr. H. P. Attwater states that it is common on the gulf coast in Arkansas county, where it does considerable damage.

The Kingbirds of Southern California.

Tyrannus verticalis, SAY.

Tyrannus vociferans, SWAINSON.

Although Mother Nature in her distribution of species may have slighted us in the matter of more numbers in the genus *Tyrannus*, still she has more than made up for it by the cunning and courage with which she has endowed our representatives. For if there is any bird more crafty in his encounters with men and more courageous among his avian neighbors than is the Arkansas Kingbird, I for one would like to hear about him.

This species, *T. verticalis*, is said to occur east of the Rocky Mountains, while it is also claimed that the Kingbird or "Bee Martin" (*T. tyrannus*) of the eastern states has been taken in California, but in as much as I have had no experience on either of these two points, I will refrain from discussing them. The Arkansas Kingbird occurs throughout Orange county, breeding in nearly every tree indigenous to this region from the scrubby "box elder" to the lofty eucalyptus. I have, however, noted that the higher the tree in which the nest is placed the closer the nest is to the main trunk. Especially do I remember a set which I took from a tall locust tree about two hundred feet from a farm house. There was a space of about twenty feet on this tree which was as bare as the proverbial "greased pole." I had no climbers but I got there just the same, and took the five fresh eggs which the nest contained. This is a large set, in fact the largest I ever took from this species, I believe. Four is the usual number while sets of two and three are common. When I went up this tree I realized that there was such a thing as a locust "thorn," but when I came down! It seemed as if there was a thorn for every square inch of that tree trunk.

The nest of this bird almost invariably contains peices of string, bits of

cotton and such other material as it may be able to purloin from the near-by farm house. The outer nest is made of coarse sticks, grasses, etc., coarsely thrown together in a saucer-shaped mass; on this the inner nest is placed and the two can nearly always be easily separated. The eggs are indistinguishable both in size and markings from those of the eastern Kingbird and the parent birds have the same courage in defense of their eggs or young that is attributed to *T. tyrannus*.

As is well known the food of this bird is not "strictly vegetarian," but I did not believe that they did so much damage to bees as they are charged with doing, until last June. At that time my father had some hundred colonies of bees in a young eucalyptus grove about one hundred yards from any building. As soon as the young birds were able to fly they came from every point of the compass to feed on those bees.

I shot thirteen of them one day and in the stomach of eleven I found stings. There were bees in the other two birds but, inasmuch as I could find no stings, they may have been drones. But in the eleven only there were stings enough to account for all the way from fifty to an hundred worker bees, and I have no reason to doubt that bees constituted their main food supply for some months, I think that twenty or twenty-five Kingbirds will easily devour two or three hundred bees in a day. This is a low estimate, but keep it up for thirty days and perhaps sixty, and enough bees are lost to more than compensate for the good done by the birds as insect destroyers.

The birds are too well known to require description at my hands, but *T. verticalis* seems to be slightly smaller than the eastern bird especially in extent of wings, while the white terminal band on the tail of *T. tyrannus* is wanting or else very narrow in the Arkansas Flycatcher.

Cassin's Kingbird may be readily distinguished from the preceeding species by its darker colors, smaller sizes and the *brown outer* web of the exterior tail feathers, which in the case of *T. verticalis* is *white*. My earliest set of this species was taken May 4, 1898 from a large nest thirty feet up in a "Blue Gum" tree, and consisted of five slightly incubated eggs. On the same day I took a set of four eggs also slightly incubated from a nest forty feet up in a willow. This nest was much like that of *E. traillii* or some of the other smaller Flycatchers built on a larger scale. I also took, on the same day, a set of three heavily incubated eggs from another "blue gum." This was also a a finely woven nest and in fact the nests of this species are nearly always better than those of the Arkansas Kingbird. My latest date is June 11 when I took two sets of four eggs each from nests placed 15 feet up in box elder trees. The eggs are uniformly smaller than those of either *T. tyrannus* or *T. verticalis* and on the whole are more similar to those of *Tyrannus melancholicus couchii* than to the eggs of any other bird that I have seen. Cassin's Flycatcher is a bird of the foothills and higher mountains rather than the valley and prefers the wilderness and more rugged hills to those occupied by man. The average set of eggs is larger than that of *T. verticalis* and the nest not usually so inaccessible. I have often heard the shrill "whistle" of this species uttered from some dead stalk of the "wild mustard" just before a storm, and coming as it does when "all the air a solemn stillness holds" it has a wierd and uncanny effect upon the ear.

HARRY H. DUNN,
Fullerton, Cal.

Self-expatiated Birds.

BY JAMES J. CARROLL.

For some time past, the writer has been devoting some leisure moments to the study of wandering American

birds, who have, of their own volition, or *nalens volens*, quitted the land of their nativity and winged their way to distant climes. To tabulate for the readers of the MUSEUM, the results of of my investigation *in toto* would be too great a task. It is our purpose to present in the present paper a list of the American species of birds recorded as having occurerd within the limits of the British Isles. It is not claimed that the list, which has been compiled entirely from books in our own library, is complete, but we think omissions are few. The British Ornithologist's Union, which is to Great Britian what our A. O. U. is to the United States, has seen proper to reject many birds from their list, that have been actually taken in their territory, on the ground that the birds taken had escaped from avaries. However the list here given contains all the species of which we have been able to find record, those preceded by an asterisk being the fortunate ones to secure recognition and permanant enrollment on the Check List of that august body of scientist, the B. O. U. In justice to the Rev. Gregory Smith, author of "Birds on the British List", London, 1886, I must add that I have taken the liberty to incorporate many extracts from his very excellent work. The list we have succeeded in compiling, is as follows:

Red Shouldered Hawk. There is a record of its occurence in Scotland.

Red Tailed Hawk. A record in Nottinghamshire.

American Rough-legged Hawk. Reported from Devonshire.

*American Goshawk. Three records.

American Sparrowhawk. Two Yorkshire Records.

*American Hawk Owl.

American Screech Owl. Yorkshire and Norfolk.

American Robin. Dover.

Red-eyed Vireo. Two records.

Great Northern Shrike. Record in Scotland.

Red-Winged Blackbird. 12 records.

Rusty Grackle. Cardiff. One record.

Meadow Lark. Three instances.

*White-winged Crossbill.

Purple Martin. One record in Ireland.

White-bellied Swallow. One record.

Hairy Woodpecker. Several records.

Downy Woodpecker. One record.

*Black-billed Cuckoo. One record.

*Passenger Pigeon. Several occurences.

Rock Ptarmigan. One record.

*Pacific Golden Plover. Norfolk.

American Golden Plover. Norfolk.

*Killdeer. Two occurences.

Spotted Sandpiper. Four occurences.

Solitary Sandpiper. 2 records.

Yellow-legs, (flavips). One record.

Wilson's Snipe. One record.

*Bridled Tern. One record.

*Noddy.

Bonaparte's Gull. 7 occurences.

Horned Grebe. Two records.

*Black-capped Petrel. One record.

Flamingo. Four records.

Canada Goose.

*Blue-winged Teal.

*Green Winged Teal. 2 or 3 instances.

Hooded Merganser.

An Archaelogical Find.

Recently some boys engaged in digging a hole to bury a lamb on the Brandt farm at Hoffman, N. Y. brought to light some very interesting relics of the ancient occupants of the valley. The find consists of four large double pointed flint knives and a stone tube, most curiouly wrought. The blades are chipped from a blue flint and are from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, and are very thin and broad for the length. Archaeologists would term them knives but their use as such was very doubtful. The stone tube was unforunately broken by the finders, but judging from the remaining perfect portion it must have had a length of eight or ten inches. Measurments of the portion

seen are as follows: Greatest outside diameter 1½ inches; diameter of the perforation at the finished end, ¾ inch; at the fracture, ⅝ inch. The bore of the tube is thus slightly conical, and the finders say that for some little distance at the end destroyed the cavity was filled with a black powder. Beauchamp, in a recent bulletin published by the state, speaks of similar stone tubes from Otisco Lake, filled or found in immediate contact with red paint. The successful perforation of these tubes must have been a most laborious and difficult task. A flint drill affixed to a slender shaft, a stick, with sand and water, and in some cases a tubular drill cutting loose a core, were used by the Indians. That this latter method of drilling was used we have ample proof in certain objects of stone having a perforation partly completed, showing a core still adhering to the bottom of the perforation. The material of the tubes was generally a soft striped slate, such as was often used for perforated tablets and other objects

The use of these tubes is problematical, but they are by some thought to have been used by the medicine men in incantations. Among the Onondagas long tubular bone or cane whistles were employed in medicine making, even within a few years. Possibly in this find we have the kit or a portion of the kit, of an ancient Mohawk medicine man. The find probably represents a burial or all that time has left of such. The soil of the site is a soft sand, which constitutes a knoll or ridge, in fact just such a situation as was generally chosen by the Mohawks for burial purposes.

Stone tubes of this nature, while not so abundant, have been found in portions of this state. None have been recorded from this immediate vicinity, save one which was found in the contents of a grave midway between Hoffmans and Schenectady. This latter carved from slate, was large and thin in this respect resembling the modern napkin ring, although longer, and was very neatly engraved over its outside diameter. The collection of A. E. Douglas of New York contains 73 stone tubes, none of which are from New York state. P. M. V. E.

The White Sheep of Alaska.

This rare wild white sheep is found nowhere in the world but Alaska, and few specimens for mounting whole have ever been obtained. This species, named *Ovis dalli* by Professor Dall, differs from its cousin, the Rocky mountain big horn (*Ovis montana*), in color, *O. montana* being a dull brown in midsummer, changing to a grayish drab in winter, with a light ashy colored patch over the rump all the year, while the *O. dalli* is snow white at all seasons; in fact, there is not a colored hair on any part of his body. He is not quite so stockily built as our "big horn," yet more trim and shapely. Two of my specimens stood forty-two inches at the shoulder. His limbs are not quite so heavy, and his horns will not average as large at the base, although quite as long. The horns of my largest specimen of 1897 measured 41¼ inches in length and 14½ inches in circumference at the base.

The flesh is the most delicious of all wild game. In the summer this sheep lives chiefly on the rich succulent growth of the *Asplenium septentrionale*, which grows in the crevices of the rock on the sunny slopes of this rugged range. This beautiful animal must endure great hardships to survive the winters of this icy north.—Dall De Weese, in *Outing*, for July.

16 Varieties Petrified Wood

some very rare, including Agatized Wood, Petrified Oak, Manzenata, etc. Pieces weigh one ounce each, by mail postpaid, only 50c.; larger pieces $1.00. JOHN GARDELLA, JR., Newtown, California.

New Bargains for August!

READ IT THROUGH. IT WILL PAY YOU

We are closing out specimens named below at very low prices. We will send on approval if you agree to return promptly prepaid what you do not care for. We will also take pay in installments if more convenient to customer. You must write quick as many of these things will go at once.

Bird Skins.

Black-vented Shearwater..... 1.50
Marbled Murrelet 1 00
Evening Grosbeak..... .30
American Quail, female..... .40
Great Blue Heron, male..... 1.50

Following from South Texas, made in February and March last:

Road Runner, m..... .50
Arizona Cardinal, m. f..... .20
Western Meadow Lark, m..... .20
Sage Thrasher, m..... .25
Mexican Shore Lark, m..... .15
Amert Titlark, m..... 12
McCown's Longspur, m..... .12
Black-throated Sparrow, m..... .20
Black Skimmer..... 60
Gull-bill Tern..... .75
Long-bill Curlew..... 60
Western Nighthawk ..... .40
Scaled Quail..... .60
Texan Quail..... .40
Vermillion Flycatcher..... 35
Cassin's Sparrow..... .50
Clay-colored Sparrow..... .25
Scissor-tailed Flycatcher..... .30

Cracked Ostrich Eggs.

In the handling of over 100 dozen Ostrich eggs we found a great many specimens cracked slightly. Some you would have to hunt quite a while to find the imperfection. They are just the same as we have been selling for one year, only for the cracks. Per dozen $2.00 Single specimen net 20c or prepaid 45c. Perfect Ostrich eggs are now worth $6 00 a dozen.

Indian Relics and Curios.

Fine Bowl, cracked..... 2 50
Sinkers..... .15
Scrapers, notched or unnotched..... .15
Points, poor, various states ..... .01
" better, " " ..... .03
" good to fine, various states..... .10
" fine..... .20
Chautauqua shell collection, used to sell at $2.50, prepaid, have 10 will sell at..... 1.25
Cactus Wood Cane..... .50
Collection of 50 kinds of minerals, all named, etc..... .75
Special rates on 25 to 50 collections.
Ostrich Egg, African..... .85
A bargain on some big Bahama Corals weighing 10 to 40 pounds each.
Marine algae per doz. cards..... .75
Scorpion, mounted in box ..... .40
Hermit Crab, in shell; all in box..... .25
Piece of Big Tree Bark, 4 x 4 inch..... .20
12 kinds of Sea Beans, all named, for.... .30
25 kinds of Foreign Birds' eggs, all named and first-class, for 1.50
Birds of Labrador, Natural History of Labrador, and O. & O. Manual, all for. 1.00
Book of Sea Mosses. 10 beautiful cards, all different, arranged in a book and tied with ribbon. The finest work in the mounting of sea mosses we have ever seen..... .... .60
Ditto, large size, fine. 1.20
Marine Algea Blotter, the top card with beautiful mountings and covered with celluloid. Very neat..... .40
Marine Algea Newspaper Clipping Case, 6 large envelopes appropriately named and bound in heavy covers, on which are beautiful mounts under celluloid, so it is not easily soiled, gold edges... .75
Marine Algea Panel, consisting of 5 card mounts, strung with ribbon, so as to hang on wall. This is to our notion one of the handsomest..... ..... .40
Marine Algea Photo Frame. The frame proper is covered with beautiful mounts that are in turn covered with celluloid to keep dust from soiling. Has back, so will stand on mantel or table. A beauty..... .60
Shell Case, a pair of Pecten irridans, hinged at bottom in which are 10 cards of algea, very neat..... .40

The above seven articles are particularly suitable for birthday or wedding gifts, being something that will be always admired. We will send on approval to any collectors, so sure are we that you will be more than pleased.

Collections.

The Young Naturalist's Marvelous collection, consists of 44 specimens, as follows: Indian Pottery, Yellow Red and Black Sea Beans, Chinese Horn Nut, Egg Capsule Periwinkle, Sand Box Shuck, Alligator Tooth, Tarpon Scale, Jobs Tears, Black eye Susans, Miamosa Seeds, Castor Oil Bean, Foreign Land Snail, Bleeding Tooth, Ring Top Cowry, Money Cowry, Tectarias, Olive, Worm Shell, American Fresh Water Shell, American Land Shell, Purpura, Limpet, Beehive Shell, Drill Shell, Button Shell, Satin Spar, Petrified Wood, Mexican Onyx, Petrified Coral, Petrified Nautilus, Petrified Shell, W. I. Branch Coral, E. I. Branch Coral, Yellow Coral, Organpipe Coral, Prescious Coral, Coralline, Yellow Sea Fan, Purple Sea Fern, Sponge, Starfish, Sand Dollar.

These are all Natural History Specimens and will delight the young and old as well. They are almost certain to create in any young mind a love for Natural History. Special prices to Teachers, where ordered in quantity for students We send the collection prepaid with descriptive list of same, for only 60c.

Special Mineral Collection, consisting of 50 specimens of good size, as follows: Actinolite, Albite, Alabaster, Allanite, Aragonite, Arsenopyrite, Asphaltum, Asbestos, Biotite, Beryl, Boltonite, Crystalized Calcite, Chalcedony, Chiastolite Crystal, Cone in Cone, Coquina, Crinoidal Limestone, Dolomite, Flint, Fossil Coral, Garnets in Rock, Geode Quartz, Gold Ore, Graphite, Gypsum, Hematite, Iceland Spar, Iron Pyrites, Kaolin, Lead Ore, Limonite, Marble, Magnetite, Mexican Onyx, Milky Quartz, Mica Schist, Nuttallite, Orthoclase, Petrified Wood, Porcelainite, Psilomelane, Pyrolusite, Pyrrhotite, Pyroxene, Satin Spar, Selenite, Silver Ore, Talc, Tourmaline, Wernerite.

These are all numbered to correspond with a list giving localities, etc. Special rates in quantity. Prepaid for 75c.

Audubon Plate. We have one of Audubon's Plates of the Iceland Gryfalcon, nicely framed under glass. It is a beautiful thing for a library. Original price $25. Our special price, strictly net, $10.

FINE SHELLS.

Another famous Philadelphia Collection of Cypræa and other Shells just added to our already large stock.

Since the publication of the July number we have added the finest lot of Cypræa we have ever handled. It comprised as complete an assortment as money can buy The rarest specimen was *Cypræa guttata* which we have sold at an even $100 cash, probably the largest figure ever paid by any American collector for a single shell. We shall not print a complete list of this collection for many rareties are either already sold or spoken for but the collection as a whole is quite largely intact. To give an idea of some of the suites, note the following which is copied from an accurate catalogue in our possession.

17 argus, 50 arabica, 30 arabicula, 50 annulus, 100 asellus, 32 angustata, 16 albuginosa, 33 arenosa, 114 cervus group, 50 cinerea, 50 carneola, 18 cylindrica, 70 caurica, 50 cruenta, 115 caput-serpentis, 12 melanastoma, 20 clandestina, 18 cribraria, 13 cribellum, 15 capensis, 25 cicercula, 12 childreni, 20 errones, 16 eburnea, 40 erosa, 16 edentula, 12 europea, 40 fimbricata, 30 gangrenosa, 13 histrio, 80 helvola, 34 isabella, 17 intermedia, 30 lurida, 100 lynx, 17 lamarckii, 17 mauritiana, 25 mappa, 18 mus 116 moneta, 13 miliaris, 16 madagascarensis, 25 nucleus, 25 nivea, 18 obvelata, 37 onyx, 17 ocellata, 25 oryza, 20 pantherina, 15 pyrum 5 pulchella, 15 picta, 25 punctulata, 20 punctata, 25 piperita, 15 poraria, 30 pustulata, 100 pediculus, 100 quadripunctata, 13 reticulata, 20 scurra, 15 stolida, 20 stercoraria, 75 spadicea, 24 Sowerbyi, 27 sanguinolenta, 33 spurca, 62 staphylæa, 60 suffusa, 11 testudinaria, 47 talpa, 12 thersites, 40 tigris, 30 turdus, 47 undata, 19 ventriculus, 60 vitellus, 40 zig zag

This simply gives an idea of some of the large suites. We have over 100 species not on the above list ranging from one to ten specimens each, some of the rarer sorts being aurantia, decipiens exusta, leucostoma, scottei, Reevei, cumingii, margarita, eglantina, gemmula, gregori, rhinoceros, teres, lentiginosa, listeri, microdon and many others. There were many rare color patterns. For instance a jet black pantherina also dark red ones Fully 75 species are represented by various stages of young from the "bulla form" up. Many distorted species were found. In fact taking Sowerby's Colored Monograph of the Cypræa and excluding a few species that have never been represented in any American collection, we had practically every color pattern represented in said work, also Reeve's Monograph of said genus.

Aside from the cypræa we secured a very choice generic collection with suites such as 80 species of Achatinella. 50 species of large Bulimus, most all species of Partula correctly named and some choice representatives of Murex, Olives, Cones &c. In all there were close on to 2000 species, besides Cypræa, representing practically every known genus in the world.

Mr John Campbell, whose collection we are describing was the first President of the American Association of Conchologists in this country. He was a man of means and refinement, and able to have the finest specimens in the market. We would like to hear from every collector who would like some of these choice shells. Give us an idea of your preference. We will send on approval and price specimens reasonable. We want your trade and small buyers of from $1 up will receive equally careful attention. Great care will be taken in labeling. Every month we are adding new and regular customers to our list. Fine specimens and reasonable prices is the secret of it all.

Maine Deer and Moose Heads.

Fifteen Deer and Two Moose Heads have just been received. The Moose are 45 and 50 dollars each respectively. They are large black heads and nicely mounted The Deer Heads were all mounted by a strictly first class man. In fact we would not accept a head from any other source at any price. Our uniform price for a fine Buck Head with handsome antlers will be $10 but we have a partial Albino Head at $15 an extra large Maine Head with long neck and part of shoulders at $18. One nice large Western Deer Head at $20. Fine Caribou Head, $18.

These heads will please you, as they have every visitor to our rooms the past month. They are LIFELIKE and have none of the "STUFFED" expression of many specimens we have seen We have two or three heads with horns shaped well for a rack for guns or other sporting goods. To a buyer of 5 or 10 heads we will make a figure that will be satisfactory.

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BIRDS, ◎ ANIMALS, ◎ FISH, ◎ REPTILES,

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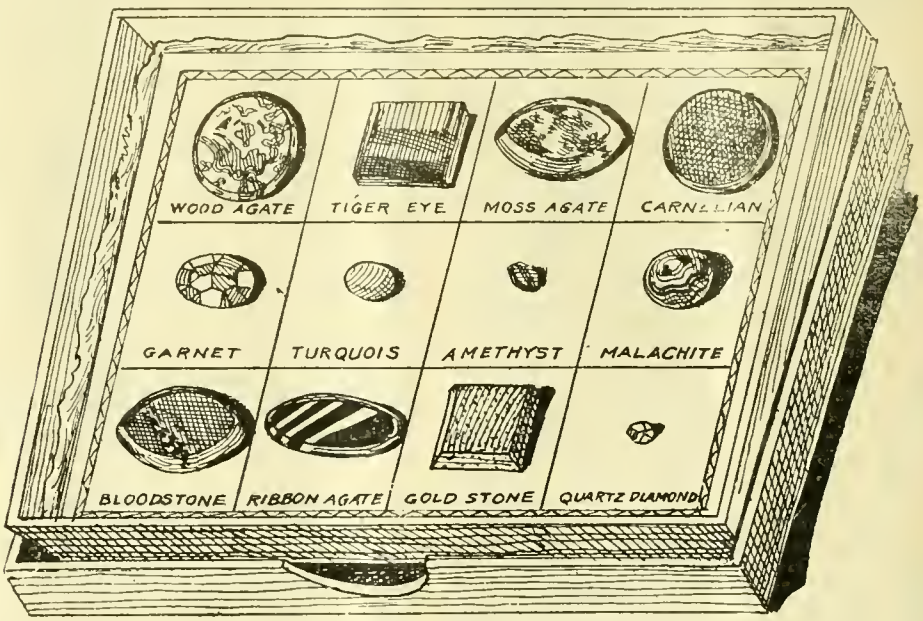
CHARLES NEWELL, President.



50c. Our Gem Collection, 50c.

We present this month a small drawing of our gem collection which, in a crude way, gives collectors an idea how it looks. As the stones are all finely cut and polished, they present a brilliant effect, which cannot fail to attract great attention in a cabinet. These 12 stones could not be bought of any dealer in gems for less than $3 00 to $5.00. and to take the rough stones to a lapidary and have them cut, would cost twice this figure. We believe every collector will want one of these collections. The price is only 50c. They will sell at $1.00 just as easily. Many years ago a Rocky Mountain dealer in minerals offered such a collection at $1.00. They were considered a wonderful lot for the price. In fact, it is a mystery to every one how the stones can be cut and polished and sold for any such figure as we offer. We confess we do not understand how it is done, unless the parties who do the work are laborers who receive but a few pennies a day for their labor. Send a dollar bill well wrapped in your letter for two collections, sell one of them to a friend in your place who will be interested in cut stones, for $1.00 and you have yours free. We guarantee that if they are shown to a few friends they will readily sell at $1.00. If you succeed in selling one, as we are sure you will and think there will be a demand for more, we will make you a figure on a dozen. Let us hear from you at once.

W. F. WEBB, Mgr., Albion, N. Y.

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Fine Florida Shells.

We have every facility for furnishing collectors or dealers with Florida Shells, or Souvenirs. We have had long experience in collecting, and the Editor of the MUSEUM, has, unsolicited by us, offered to answer any inquiries as to our responsibility or fair dealing. If you wish to see quality of specimens before placing larger orders, send $1 for a box of samples. All cleaned and correctly named. Price list for stamp and all inquiries promptly answered. Give us a trial.

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Florida Land and Fresh Water Shells. Also Centipedes, Scorpions, Crabs, etc. in alcohol at a bargain. Address with stamp.

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Longwood, Florida

Wholesale Bargains.

We have on hand many fine things in such quantity we quote low rates on wholesale orders, in order to make room. The material offered in every instance is as low as money can buy. Look over the list carefully:

Purple Sea Plumes from the Bahamas. Large size, 4 to 5 feet, $2.50 per dozen. Medium, 2 to 3 feet, $1 50 per dozen.

Ostrich Eggs. South African specimens, at $6 00 per dozen.

Cypræa Annulus, Ringtop Cowries, from the East Indies, 50 cents per quart.

Cypræa moneta, with varieties, Money Cowry from Singapore, 50 cents per quart.

Black Haliotis, 4 to 5 inch, from Monterey, Cal. 75 cents per dozen.

Red Haliotis, from Monterey, 7 to 10 inch, at $1.50 per dozen.

Strombus tuberculatus Silver Lips, 2 inch, from Singapore, at 36 cents per dozen.

Strombus alatus, Purple Mouth, from Fla., at 24 cents dozen.

E. I. Coral fragments, 2 to 3 inch, 20c dozen

Melongena corona, Crown Shell, from Fla., 24c doz.

Sabre Beans, mammoth, 16 to 20 inches, curious, Bahamas, at 50c doz.

Nereta peleronta, Bleeding Teeth, Bahamas, at 50 cents quart.

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SEPTEMBER, 1899.

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A Monthly Magazine Devoted to Research in Natural Science.

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A Monthly Magazine devoted to Ornithology, Oology, Mollusca, Echinodermata, Mineralogy and Allied Sciences.

Walter F. Webb, Editor and Manager

Albion, N. Y.

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The Jays and Crows of Southern California.

Cyanocitta stelleri frontalis (Ridgway).

Aphelocoma californica obscura (Anthony),

Corvus corax sinnatus (Wagl).

Corvus cryptolencus (Couch)

Corvus americanus (Hud.)

Nucifraga columbiana (Wils.)

Cyanocephalus cyanocephalus (Wied)

The above seven species comprise the list of members of the family *Corvidæ*, either occurring as migrants or as residents in this state, south of the Tehachipi mountains. These mountains serve as a dividing line for the distribution of many species both avain and mammalian. For instance, to the north of these mountains the prevailing form of *Otocoris* is supposed to be *O. alpestris rubea* and that to the south *O. alpestris chrysolaema*.

The Blue-fronted Jay occurs during the breeding season among the coniferous trees of the higher mountains and occasionally wanders down among the oaks of the lower hills during the winter. Dr. Joseph Grunel in his Hand List of the Birds of the Pacific Slope of Los Angeles Co. states that the bird is a late breeder and cites two sets taken on June 1, 1895, and June 4, 1896, as examples. The bird is somewhat larger than our local species, Belding's Jay, and is, I believe less noisy and quarrelsome. Very rarely, and then only during the most severe of our winters, one appears at this altitude, 500 feet, and sometimes remains a few days among the Jays of this region.

But our old standby is the southern form of the California Jay. If ever there was a noisy braggart in the feathered tribes it is this fellow in his brilliant coat of blue with grayish-white trimmings. Though this bird is numerous and noisy during the winter it gradually becomes more quiet until the breeding season is over when he again resumes his boisterous ways and comes freely about houses and barns. Nests with eggs may be found from April 1st to May 30th but the best time to look for them, and in fact the best time to collect in this county, is from May 10th to June 1st. My first set for this year was taken on May 10th. On May 5th the nest contained one egg. I returned every morning thereafter until the 7th when there

were four eggs in the nest. On the mornings of the 8th and 9th I could not go to the nest but on the 10th took the nest and set. The male never scolded until my hand was almost on the nest, and in fact this bird is usually very quiet when any intruder is near his home. The female Jay became so tame that she merely slipped off the nest and sat within a few feet of my hand while I took the set. The eggs were fresh, at least incubation was not noticeable and the nest typical of the several other nests found by me this year. The bottom platform or outer nest was composed of coarse twigs, then a nest of rootlets lined with horsehair, resembling on the whole a well-built nest of *Minus polyglottus*. It was placed three and one-half feet up on a wild walnut limb. the whole overgrown with a dense chilicothe vine.

Shortly after the discovery of this nest I found another containing three eggs. I left this set and in four days returned for it, but found still only three eggs, one of them "pipped." Needless to add I left the set. This nest was very poor, scarcely more than a platform of coarse twigs placed 8 feet up in a thick clump of poisoned oaks growing over an alder tree. These eggs were decidedly gray in the ground-color, whereas the first set was of a beautiful green. The markings were also larger and fewer in number in the second set. However, I have often noticed that if from natural causes a set is small in numbers it is usually more strikingly marked and the individual eggs are larger than in normal sets.

Especially do I remember my third set. One Sunday afternoon in May, the 14th to be exact, a young friend of mine who has a decided leaning toward Botany, came to the house and asked me to take a trip with him over the hills in search of some rare ferns. Away over the "Eternal Hills" we went, now and again flushing a Barn Owl from his midday snooze in a bushy oak, frightening whole bevies of young Quail from their feednig grounds. Once in a while a Western Red-tail rose, dark against the western sun, with a shrill cry of dissatisfaction and rising high in the blue ether called his mate from her nest in some secluded sycamore. Nature was at her best, nature such as Aububon saw but not such as the average Audubonian sees. But I digress. Having filled our boxes with ferns we passed on down a rocky canyon, leaping from boulder to boulder over the dry bed of the water course —in winter a raging torrent. California Bush Tits, happily unconscious of their unpronounceable Latin name, scolded us roundly from every oak, while from the top of some bush an exuberant Thrasher poured forth his love song to his nesting mate.

Suddenly rounding a bend in the stream I passed under a "Sumach" bush which overhung the stream. I heard nothing, yet with that intuition born of the woods I turned just in time to see a large blue bird sail slowly down into a clump of wild gooseberry bushes. My compaion came up just then and I with his help managed to secure the nest and the four eggs it contained. They were exactly like the first set, being of a greenish-blue ground color speckled and blotched with clove brown. In fact to this enthusiastic young naturalist, Louis Brockmann, and to his brother Harry, I owe much of my success as a collector, and their close methods of observation have taught me many things about the birds. Of this set three eggs were badly incubated and one infertile. The nest was composed, as was the first, of three distinct cups; an outer nest of coarse twigs, an inner of fine rootlets and a thick lining of *black* horsehair. In all cases, and I have found at least six nests this year, black was the color of the horsehair lining. Evidently they know how muce more beautiful those rich green eggs would be against a black back-

ground.

Commonest of all the *Corvina* of this immediate locality is the American Raven, *Corvus corax sinuatus*. In the lower parts of the county where willow timber is abundant *C. americanus* is "the whole thing," but back here in the hills wherever the cliffs are suitable for nesting sites this species of Raven may be found, often singly, usually in pairs, never more than two (one pair) on the same cliff. I found but one nest this season that contained anything. One day in the latter part of May, about the 25th I believe, I found this nest on the north face of a triangular cliff. It held the large number of *six* young, nearly ready to fly. It was well built and lined to a depth of apparently an inch or more with soft black fibres and a few feathers. The nest was scrupulously clean, a condition I have found to be true of nearly every nest of this species which I have ever seen.

HARRY H. DUNN,
Fullerton, Cal

(To be continued.)

A Naturalized Volcano.

Written by A H. Berry in September Mineral Collector.

So far it had been necessary to take the volcano for granted. The ticket for the trip called for a visit to Kilauea, and the man in Honolulu who sold it had spoken of the volcano as an existing geographical and geological fact. Even the signboard of the hotel read "Volcano House," so there must be such a thing in the neighborhood. Yet there was not the faintest vestige of the burning lakes of flame and the crash of nature in hottest convulsion which were written about, page after page, by people who had seen Kilauea and given it a puff in the visitors' book at which the traveller had glanced before going to bed the night before.

All the day before had been given to thirty odd miles of staging steadily up the mountain. There had been a sight of dense jungles where guavas grew along the roadside, where every great trunk seemed to serve for a botanical hotel for a lodging population of ferns and orchids, where the ferns themselves were trees ten and twenty feet high. Just out of Hilo the road began in the cane fields, where every breath of the trade wind showers a stifling haze of golded-brown pollen, better to look at than to breathe. Then it led into the clammy dampness of the jungle, spiced with the odors of the wild ginger and a score of blooms known hitherto only by learned names in hothouse setting. How the senses reel where choice exotics are the wayside weeds! Here was a group of cabins with queer red daubs trailing snakewise above the door and probably conveying interesting Asiatic information, homes of the small Japs, whom one passes swaggering along the way, and making clear that the future of Hawaii if not American would be surely Japanese. More modestly set in nooks of the forest, richer in local color, here and there was a grass house of the native Hawaiian. Then came the lands where fortunes are looked for in the cultivation of coffee. The planters come to meet the volcano stage for it carries the mail. At every stop before each of these trim little orchards of fifty or a hundred acres the planter bids you "look at those cherries; did you ever see anything finer?" and you learn that there is a stage of the coffee when it is a cherry. Or from his pocket he brings out something that has the coffee shape but the silvery drab of a gentle Quakeress, and as he talks about the bean in the parchment skin you come to know that coffee has its own history before it comes even to be roasted, and the history begins very prettily indeed on both sides of the road with the cream and red of the cherries and the two shades of green on the leaves. And all these young planters speak so confidently of

the estates they are building up in the finest and most wholesome climate in the world that you try to forget the sad history of those other young planters who were just as confident in Ceylon until they met their troubles.

Beyond the coffee the road plunges again into the jungle, but you begin to notice that you can see further along the vistas, and the ferns are getting less treelike and the break is becoming more bushy. Soon you pass out of the forest and find yourself on barrens of brake and gaunt streaks of bare rock, and the driver points his whiplash at it and says "Lava," and you begin to wonder that you can discern nothing of the volcano which you have travelled thousands of miles to see. And that lava, too—it looks like any other wayside rock; surely nobody but a mineralogist could see any difference. Now that you are high up on the fern barrens you can see the eternal snows of Mauna Kea, which looks so out of place within the torrid zone; you can see the crest of Mauna Loa, and possibly you struggle to be glib about the pronounciation of the summit crater of Mokuaweoweo, which the guidebook spells for you and leaves you without assistance in getting finished when once you have started to speak about it. And when the sun goes down behind the great mountain the eye can see nothing ahead but a smooth and barren slope with nothing to indicate that you are within five miles of "the giant hidden forces of nature," "the central fires of the earth;" odd isn't it, how the old phrases of the school books cling in the memory? Ask the driver where is Kilauea and he answers "Why that's where I'm a taking yer," and the disappointment continues. Now you feel at intervals upon your cheeks a breath of warm and clammy vapor with the reek of brimstone, and there is some comfort in knowing that the stories of the volcanos hereabouts have at least that much of foundation. In the dark of the evening the stage draws up at the Volcano House and even before the question is put Peter Lee answers it by saying:

"You can't see the volcano at night 'cause there's a 'wapor' there every night."

It is rather unsatisfactory to know that a great volcano is within thirty yards and yet invisible. The trouble is that everybody has hammered into his mind in early school days an ideal volcano, a smooth and pointed cone, a shaft of smoke, and a monstrous cloud filling half the sky; Vesuvius in fact. Now Kilauea does not rear its head an inch above the surface; it is a place where for many square miles the bottom has dropped out of things and has sunk 500 feet. No wonder that it is vain to look for it on the road. But both our newly naturalized volcanos on Mauna Loa, Kilauea on the slope and Mokuaweoweo on the summit, are greater than Vesuvius or Ætna, and when they are boiling their enormous lakes of flaming lava they seem to be doing something bigger than coughing up ashes and pumice and such light stuff and making a sulphurous fuss about it, which is about the limit of the powers of the Italian craters.

With earliest dawn you look out of your window, and still the evasive crater is hiding itself, and the mighty forces of nature keep themselves hidden. The view is a stretch of dun mountain slope; not a tree in sight, not a single precipice or crag, nor yet a boulder large enough to attract the gaze—a smooth slope of fern and low bush. Before the Volcano House is a garden with flowers of America of the temperate zone. A hundred feet away the hedge of roses poises at the edge of a lake of white fog. For miles the eye traces the shore of that white and motionless lake. There is surely Peter Lee's "wapor," and somewhere in that pond is the volcano, leisurely beginning its daily exhibition. You are disposed in the chill morning air to hold Peter Lee responsible for the

failure of his show when you learn that he has spent the last thirty years at the crater. But he, familiar with volcanic habits, assures you that there never is anything to see until after breakfast, and tells you the story of the ohelo berry, which used to be sacred to the Goddess Pelo in the old days before Chieftess Kapiolani—not Kalakaua's Queen, but an ancestress—stood on the crater lip and defied the goddess and all her infernal powers, and the "kapus" of the ancient and bloody paganism were broken, and Hawaii accepted the Christianity that had been sent out from Massachusetts to prepare the eight islands in the fullness of time to become American. You can eat some of the berries for breakfast, he says. So you can, for breakfast and every meal besides, while you tarry on the crater edge, to say nothing of picking your fill as you explore the patches of soil which have gathered in between the lava sheets for the encouragement of a stunted mountain vegetation. The story interests, but nothing can remove the sense of disappointment at the way in which the expected grandeur of the volcanic spectacle sneaks under its white blanket. But breakfast comes on and there are bowls of the ohelo berries, good to eat, satisfactory to a pagan goddess in a fire pit, and satisfactory to a modern sightseer in cooler surroundings; like a cranberry grafted on a huckleberry bush, some one says, the red size of the one and the sweetness of the other.

Then the horses are brought around from a line of grass-thatched huts, which prove to be the stables, for it is three miles to the mouth of the pit of fire to the Halema'uma'u, about which scholars in the languages may wrangle without end as to whether it has apostrophes in its spelling or not, and dependent on that point whether the same means the house of ferns or the house everlasting. The journey is fairly out of sight. You go a hundred feet to the brink of the white lake; at that jumping off place you make a vertical descent of 500 feet, and the rest of the distance is to be ridden over the lava crust of the crater itself. Before you begin to be nervous at the prospects of groping in the white depths of that vapor lake, for you doubt Peter Lee since breakfast is past and still there is nothing to see, a new problem arises. The Volcano House stables have but one sidesaddle, and that is already occupied by an elderly lady who may not be dislodged. Every other woman must ride Hawaiian fashion, that is man fashion, astride, or else must walk.

"How am I ever going to ride on that kind of a saddle?" a woman asks. "Must I really ride astride? I never can do it in the world."

But Peter Lee's two buxom daughters have heard that complaint many a time before and they are used to it. One has the stirrup ready and the other stands ready to attend to other little problems as to which there exists an unexpressed but none the less uncomfortable doubt. You spring dubiously into the air and without your knowing exactly how it is done those skirts are adjusted satisfactorily, although you do feel like a collection of bundles. There is little doubt as to your ability to make these arrangements for yourself, for you learn that at a certain point far down in the depths of the crater you have to leave the horse. But the youngest Lee girl hops into the saddle to show you how it is done and whispers to you, "Albert knows how;" whereat you look rather doubtfully at the Hawaiian who is to guide the party.

Now you revise your ideas of the veracity of Peter Lee and of the grandeur of Kilauea as well. While you have been worrying over the introduction to horsemanship after the Hawaiian fashion the sun has brought its beams to bear on the vapor lake, and it has vanished except for a mist

bank snuggling in the shade under the eastern wall. No doubt now as to the volcano or its whereabouts. You feel giddy when you see almost at your feet a vast pit, 500 feet deep, the bottom of which has fairly dropped out from the most solid thing you know, the time honored standard of comparison for solidity, the solid earth itself and a mountain of rock. Some one recites the statement of the guide book that the crater is so many miles long and so many miles wide and has a depth of so many feet on the lava floor. But what meaning has all that; what does it amount to! Figures are an impertinence in the presence of nature operating in its grand method. Down below there in that abyss which has sunk straight down from the mountain slope there may be a certain number of square miles. But what is a square mile to you? Who would reel off a tape measure to make a record of the magnificence of the fire and fury which made that pit? Mile after mile, if a tale of miles be needed for the seeing of power in its infinite degree, the eye sees the cliff square cut above the crater floor, square cut with the mountain slope, above which they do not rise a single inch; one cannot make too clear that impression of a vast dropping down; there is a thrill of fear that it may drop still further while you are below there. Black, green, red these walls bound a floor all black which from the distance seems as level as a floor of carpentry. It is only when you get down to it that you see how——-

But before you see that you have to face the getting down. Only one path exists through all that sweep of precipice, a breakneck place of scrambling in and out in fearsome zigzags down a sheer face of rock. They tell you that the horse is surefooted, that he has carried blank hundreds of people up and down that trail. There are times when arithmetic loses its power to console; this is one of them, and you feel that your own feet are surer on such a ladder, and disregarding that difficult matter of mounting again on the other kind of saddle you dismount and make the descent afoot, and if truth be told, letting yourself over certain steepnesses with a hand clutched on the ohelo bushes which knot their roots in every rock cranny. It is only on the return trip hours later—and perhaps just as well that it is so—that you see the wayside cross that marks the death spot of one for whom that scramble proved too much, the only death recorded for Kilauea since the heathen days when Goddess Pelo's incandescent wrath sometimes refused to be appeased with her usual sacrifice of a red hen and a black pig and a bunch of ohelo berries, when she could be pacified only by something that gave a despairing scream when it was tossed into the fire lake in which Pelo lived. Cruel days of heathenism! It is well that they have passed away, that Kapiolaui made an end of the last of Kilauea's "kapus;" we order things so much better nowadays. Still you may happen to see the Hawaiian guide, Albert, as he helps you down the slide, pick a twig of ohelo and slip it into his pocket, and you may chance to see a little sprig of green floating down through the hot air into the pit where Pelo once lived, the Halema'uma'u; and, though Albert walks about thirty miles every Sunday to go to church and sing hymns, you feel a stray wonder as to whether the old gods are after all quite dead.

At last and out of breath you have scrambled down to the floor of the crater, and with the assistance of a rock you find that the Lee girl was right when she told you Albert knew how. Level as that lava floor looked from the brink of the precipice, you find that now it has its ridges and its hollows, and rarely can you see far ahead. At the very beginning is a bridge across a deep gorge in the rock, a split in the lava reaching to

warm depths below, of which you get a whiff as you ride over. Here begins the string of lava blocks which have been set up to mark the path across the lava surface, where in the dull sameness it is easy to get lost and hard to find oneself or to be found when astray. There is not a level spot anywhere; the surface shivers under the horse's hoof in glassy splinters with a crunching sound as though one were going over spilt sugar. At every turn the lava seems as though frozen stiff in a wild rush to engulf the incautious trespasser; here in such weird shapes as Niagara takes on in winter, there twisted like ropes and cables. Everywhere are cracks and crevasses. Besides the strange shapes of the lava under foot which hold the eye, there is yet nothing to see but the next slope of the lava, the next little valley into which the string of the guide book shows the path to descend, and the wider view is bounded by the line of cliffs quivering through the hot emanations of the crater. You feel the heat, the glassy surface reflects the sun, no breeze dips down into that hole as it sweeps overhead about its own better business, and there is a constantly growing impression that the eternal fires are smouldering not so far under that crusted surface. At last the corral, beyond which the horses may not go, is reached. Here is water, a need well appreciated for the last mile or so over that torrid plain. In Kalauea the well borer would tap fire, not water, and springs are replaced by vents puffing out steam and brimstone. But a few sheets of corrugated iron set on a slant serve to condense the vapor which settles at nightfall and to drip it drop by drop into a bucket in the shade so that it may be a trifle less warm for tourists and horses.

Beyond the corral the surface is more rent and torn and twisted and jagged. The lava is hot under foot; almost every little crack in the field is edged with a crust of dirty yellow from the brimstone deposit; as you step across a rift a sweltering gust of sulphur and fused chemicals stings the eyes and chokes the breathing. To the sun's heat in that breathless depth the earth is surely now contributing from its own hot store. You step from the path to a fuming chimney projecting from a glazed surface. The moment's glance down that shaft shows a trembling chasm of hot and sulphur-coated rock. The guide puts his stick into a rift in the lava or drives it anywhere through the glassy crust and brings it out ablaze after just touching that fervent heat over which you are walking with no more than five or six inches of slag between. Of course it's hot as you draw near the shaft whereby the earth makes a safety valve for its pent up forces at work far below in the centre of the globe. It is all very well to reassure oneself with the statement there is no danger, but even the men in the party have ceased to wander off for little lateral trips of exploration and are seemingly content to let Albert pioneer this part of the path if that is to be called a path which is merely hot rock and a series of guide stones.

There is a throb and a quiver and a fever dancing in the air ahead, and seen through it the encircling cliff in the distance seems to reel and bow. It is not quite certain that the lava underfoot is shaking, but there is a tremble unmistakable and a grumbling below. There is more sulphur in the heated air; the air is hotter than it has been. Soon we are standing at the baked verge of a deeper abyss within the pit, and place of evil vapors of metals reduced to a steam that scars and scorches, a place of dread subterranean noises, and Albert announces "Halema'uma'u."

It is then that one may notice a little bit of green dropping into the inferno of swirling vapors, perhaps a twig of ohelo such as pagan Hawaii dropped into Pele's home of terror. Anyway you chance to see Albert put

such a twig into the pocket of his blouse far away back in that distant world where the soil was cool and green things grew, long before you came into this place of torments, this imbo and Gehena and place of burnings. Well, what if he did? If you were a Hawaiian and no longer ago than in your grandfather's time, even in your own father's boyhood, this Pele was a goddess capable of much harm unless properly placated, you might yourself somehow feel it best to be on the safe side and toss over your own little sprig of ohelo. Of course such a demon as Pele could impress only wild savages, but it is not the Hawaiians who hold ideas about spilt salt and broken mirrors and that sort of thing.

Guide Albert and Peter Lee and all who know the crater tell of its three conditions. It is most commonly quiescent, which means that the lava level in the Halema'uma'u is at a standstill and that much of it is scummed over with a dark slag; one or more open places show the incandescence, and these spots are known as the lakes of fire. When from these lakes arise fountain jets and sprays of fluid lava and the crater is boiling it is said te be active. A greater stage of activity is when the Halema'uma'u fills and boils over and the lava runs out upon the crater floor of Kilauea; that is an eruption All these are various stages of magnificent displays of fire, the despair alike of brush and pen to describe.

But there is another and a different stage of the active crater which is very rare indeed, and attracts all those who can reach the spot in time. That is when some physics of the earth's forces causes all the pitful of melted and flaming metal to be sucked back into the globe which has been striving to shoot it forth. Such a thing happens only at rare intervals. They say that when it happens it is a sure sign that there will be an outburst of activity at the Mokuaweoweo crater on the distant summit of the mountain up among the snows. This year's eruption of that pit of fire was preceded by an emptying of Halema'uma'u in the Kilauea crater.

Of course the mathematician was at work. He was happy at the chance to triangulate the downward abyss and to announce that the bottom of the pit of which the swirling vapors gave now and then a glimpse was 947 feet below the hot rock on which we stood. But it was not the number of feet which took the breath. It was the general stupendousness of it all; the collossal scale of nature's operations; the littleness of the spectators perched in fear upon a rock. Once it was possible to see through the heat and the smother to the floor of the pit itself and the mouth of the chute through which the lava is fed from furnaces below.

And then you go back to the corral and mount the waiting horse, for Albert does know how, and back you go to the Volcano House to eat more bowls of ohelo berries with cream and sugar.

Butterflies Worth Collecting.

The first portion of the well-known collection of British butterflies and moths formed by the late William Machin, who was a compositor in a London printing firm, was sold by auction on February 26th, at the rooms of Mr. J. C. Stevens, King street, Covent Garden, London. The collection, formed during a period of fifty-eight years, was chiefly rich in a long series of rare and now extinct British species. The specimens were thoroughly authenticated as British, and as there was a large attendance of buyers, the prices generally were higher than the usual average, varieties especially fetching high rates. Among the earlier lots of butterflies, four specimens of *Pieris daplidice*, taken in Kent, reached 16*s*. to 18*s*. each. A bred variety of *Argynnis paphia*, with

confluent spots on the underside, sold, with seventeen other specimens, for £2 2s. A variety of *Vanessa cardui*, taken on Hackney Marshes, fetched £3 10s. A fine variety of the purple-emperor (*Apatura iris*), with yellow under wings, £3 5s. Six specimens of *Polyomniatus dispar*, "from Mr. Henry Doubleday," fetched from £2 to £5 5s. each, according to size and condition, the latter price being for females, the finest males only fetched £4 8s. Sixty-three typical "blues," including a specimen of small copper butterfly (*P. phlaeas*), with the blue spots on the hind wings larger than usual, reached £3 10s. *Lycæna acis*, £2 for a pair, and £2 10s. for three specimens. Among the moths a specimen of *Sphinx pinastri*, from the late Mr. F. Bond, went, with nine *Chaerocampa elpenor*, for £1 10s. Two *Sesia scoliæformis*, a yellow-banded variety of *S. culiciformis*, and eleven others, sold for £2 2s. Four *S. sphegiformis*, labelled "from Tilgate Forest," with six *S. chrysidiformis*, fetched £2 5s. Varieties of the common garden tiger, *Arctia caia*, were not specially fine, the highest price being £2 2s. for three. *Laelia carnosa* sold in pairs, at £1 7s. 6d. to £2 2s. Seven specimens of *Bombyx trifolii*, one being a fine variety bred by the late Mr. Machin, fetched £3 10s. A fine series of eight specimens of *Lasiocampa ilicifolia*, taken at Cannock Chase, £2 5s. to £4 5s. a pair. A fine female *Noctua Subrosea* sold for £4 10s., the six other specimens fetching £4, £4 5s. and £5 5s. per pair. *Cleora viduaria*, which has become valuable during the last few years, £1 15s to £3 5s. a pair. The thirty-eight drawer mahogany cabinet that contained the collection, sold for nineteen guineas. The total amount realized for the collection of macro-lepidoptera, or butterflies and larger moths, being £363. We understand that Mr. Machin's still more celebrated collection of British macro-lepidoptera has been purchased as a whole by a well-known London amateur naturalist.

Frogs and Toads.

Some of the differences between frogs and toads may be summed up as follows:

Beginning at first principles they both lay their eggs in the water; those of the frog are, soon after deposit, about the size of a pea, jelly like, and adhering in large masses, while the toad lays a long string in two rows.

Frogs have smooth skins and are chiefly aquatic, though they come frequently to land, and there obtain much of their food. Toads are smooth when young, but soon become covered with warty prominences, which contain a whitish fluid. The two large spots on each side of the head, at the back, discharge most freely. This fluid is not poisonous, nor does it produce warts upon one's hands, as is often reported, but is to the toad a valuable means of defense, as it is particularly disagreeable to most animals who would sieze him with their mouth, either in sport or for food.

Frogs have teeth, the toad has none. Frogs seem to prefer to get along in the world by jumping, while the toad frequently walks.

Observing some toads singing, a short time since, they were seen to inflate their throats remarkably, often to the size of a hickory nut, and in some cases they were not disturbed when we stooped down and tickled the throat with the finger. Here in the east our Bull Frog is Rana catesbiana, the Green Frog Rana clamata, Leopard Frog Rana virescens, Wood Frog Rana sylvatica, Cambridge Frog Rana cantabrigensis, Spotted Frog Rana areolata, Northern Frog Rana septentrionalis, Pickeral Frog Rana palustris, Cricket Frog Acris gryllus, Swamp Tree Frog Chorophilus triseriatus, Pickering's Tree Frog Hyla pickeringii, Common Tree Toad Hyla versicolor. The Common Toad is Bufo lentiginosus, the Spade-foot Toad Scapiopus holbrooki.

A NEW LOT OF FOSSILS.

While on our recent trip south we secured a fine lot of Pliocene Fossils, taken in the vicinity of the Caloosahatchie river in Florida. This is a region that has had few explorers after fossils and the results are that the specimens possess great interest. The quality of the specimens is also good, much better than is usually the case with fossils of this nature. The species have all been carefully gone over by the curator of one of our leading Pennsylvania museums, carefully sorted up and accurately named. To our notion, fossils are of little value without a name and locality.

These specimens were secured at a usual depth of twenty feet below the surface of the ground. They are fully written up in the proceedings of the Wagner Free Institute, by Prof. William H. Dall, of the Smithsonian institution, of Washington, D. C. Any collector having access to most any of our larger museums will find the above proceedings and illustrations of the species.

We offer single specimens at very reasonable prices, or will make up into collections, as follows:

Collection of 50 species, representing a large number of genera, all carefully labeled for $4.00.

Collection of 75 species, all carefully labeled $7.50.

Collection of 100 species, all carefully labeled $10 00.

Collection of 200 species, all carefully labeled $30 00.

Collection of 200 species, giving suites of each kind, usually of from 3 to 5 specimens, in all aggregating over 750 specimens, for $50.00, which is at the rate of only seven cents a specimen.

At the above figure no man can afford to go to Florida to collect these interesting specimens. We are told that less than ten museums in the United States possess a series of the above specimens, and unless secured within the past year, the British museum does not possess a series from the above locality.

A large proportion of these will be sold almost immediately on the appearance of this advertisement, hence you should write at once if you wish to secure any of them.

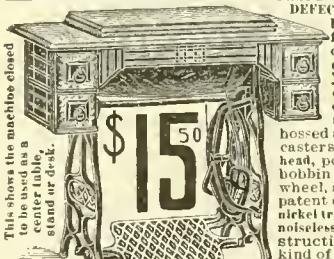
WALTER F. WEBB, Mgr., - - Albion, N. Y.

SEND NO MONEY WITH YOUR ORDER, cut this ad. out and send to us and we will send you OUR HIGH GRADE DROP CABINET BURDICK SEWING MACHINE by freight, C. O. D. subject to examination. You can examine it at your nearest freight depot and if found perfectly satisfactory, exactly as represented, equal to machines others sell as high as $60.00, and THE GREATEST BARGAIN YOU EVER HEARD OF, pay your freight agent our Special Offer Price $15.50 and freight charges. Machine weighs 120 pounds and the freight will average 75 cents for each 500 miles. GIVE IT THREE MONTHS' TRIAL in your own home, and we will return your $15.50 any day you are not satisfied. We sell different makes and grades of Sewing Machines at $8.50, $10.00, $11.00, $12.00 and up, all fully described in our Free Sewing Machine Catalogue, but $15.50 for this DROP DESK CABINET BURDICK is the greatest value ever offered by any house.

This illustration shows the machine open, ready for use.

BEWARE OF IMITATIONS by unknown concerns who copy our advertisements, offering unknown machines under various names, with various inducements. Write some friend in Chicago and learn who are reliable and who are not.

THE BURDICK has every MODERN IMPROVEMENT, EVERY GOOD POINT OF EVERY HIGH GRADE MACHINE MADE, WITH THE DEFECTS OF NONE. Made by the best makers in America, from the best material money can buy.



This shows the machine closed to be used as a center table, stand or desk.

SOLID QUARTER SAWED OAK DROP DESK CABINET, piano polished. One illustration shows machine closed (head dropping from sight) to be used as a center table, stand or desk, the other open with full length table and head in place for sewing. 4 fancy drawers, latest 1899 skeleton frame, carved, paneled, embossed and decorated cabinet finish, finest nickel drawer pulls, rests on four casters, adjustable treadle, genuine Smyth iron stand. Finest large High Arm head, positive four motion feed, self threading vibrating shuttle, automatic bobbin winder, adjustable bearings, patent tension liberator, improved loose wheel, adjustable pressure foot, improved shuttle carrier, patent needle bar, patent dress guard, head is handsomely decorated and ornamented and beautifully nickel trimmed. GUARANTEED the lightest running, most durable and nearest noiseless machine made. Every known attachment is furnished and our Free Instruction Book tells just how anyone can run it and do either plain or any kind of fancy work. A 20-Years' Binding Guarantee is sent with every machine.

IT COSTS YOU NOTHING to see and examine this machine, compare it with those your storekeeper sells at $40.00 to $60.00, and then if convinced that you are saving $25.00 to $40.00, pay your freight agent the $15.50. WE TO RETURN YOUR $15.50 if at any time within three months you say you are not satisfied. ORDER TO-DAY DON'T DELAY. (Sears, Roebuck & Co. are thoroughly reliable.—Editor.)

Address, SEARS, ROEBUCK & CO. (Inc.) Chicago, Ill.

Bargains for September!

We are cutting prices in many cases way below cost to close out the greater share of our large stock. Some branches of our business will be dropped entirely. We offer you extra inducements to buy now. Remember no poor stock will be sent out unless distinctly understood in advance.

Bird Skins at Reduced Prices.

Postage extra if you wish sent by mail.

Black-vented Shearwater..... 1.50
Marbled Murrelet..... 90
[illegible] Grosbeak..... .28
American Quail, female..... .30
Great Blue Heron, male..... 1 00

Following from South Texas, made in February and March last:

Road Runner, m..... .46
Arizona Cardinal, m. f..... .19
Western Meadow Lark, m..... .19
Sage Thrasher, m..... .24
Mexican Shore Lark, m..... .14
Amert Titlark, m..... .12
McCown's Longspur, m..... .12
Black-throated Sparrow, m..... .18
Black Skimmer..... 55
Gull-bill Tern..... .70
Long-bill Curlew..... .55
Western Nighthawk..... 38
Sealed Quail..... .55
Texan Quail..... 38
Vermillion Flycatcher..... 34
Cassin's Sparrow..... .45
Clay-colored Sparrow..... .25
Scissor-tailed Flycatcher..... .28

Cracked Ostrich Eggs.

In the handling of over 100 dozen Ostrich eggs we found a great many specimens cracked slightly. Some you would have to hunt quite a while to find the imperfection. They are just the same as we have been selling for one year, only for the cracks. Per dozen $2.00 Single specimen net 20c or prepaid 45c. Perfect Ostrich eggs are now worth $6.00 a dozen.

Indian Relics and Curios.

Fine Bowl, cracked..... 2.50
Sinkers..... .15
Scrapers, notched or unnotched..... .15
Points, poor, various states..... .01
" better, " " ..... .03
" good to fine, various states..... .10
Chautauqua shell collection, used to sell at $2.50, prepaid, have 10 will sell at..... 1.25
Cactus Wood Cane..... .50
Collection of 50 kinds of minerals, all named, etc..... .75
Special rates on 25 to 50 collections.
Ostrich Egg, African..... .85
A bargain on some big Bahama Corals weighing 10 to 40 pounds each.
Marine algae per doz cards..... .75
Scorpion, mounted in box..... .40
Hermit Crab, in shell; all in box..... .25
Piece of Big Tree Bark, 4 x 4 inch..... .20
12 kinds of Sea Beans, all named, for..... 30
25 kinds of Foreign Birds' eggs, all named and first-class, for..... 1.50
Birds of Labrador, Natural History of Labrador, and O. & O. Manual, all for. 1.00
Book of Sea Mosses, 10 beautiful cards, all different, arranged in a book and tied with ribbon. The finest work in the mounting of sea mosses we have ever seen..... .60
Ditto, large size, fine..... 1.20
Marine Algea Blotter, the top card with beautiful mountings and covered with celluloid. Very neat..... .40
Marine Algea Newspaper Clipping Case, 6 large envelopes appropriately named and bound in heavy covers, on which are beautiful mounts under celluloid, so it is not easily soiled, gold edges... .75
Marine Algea Panel, consisting of 5 card mounts, strung with ribbon, so as to hang on wall. This is to our notion one of the handsomest..... .40
Marine Algea Photo. Frame. The frame proper is covered with beautiful mounts that are in turn covered with celluloid to keep dust from soiling. Has back, so will stand on mantel or table. A beauty..... .60
Shell Case, a pair of Pecten irridans, hinged at bottom in which are 10 cards of algea, very neat..... .40

The above seven articles are particularly suitable for birthday or wedding gifts, being something that will be always admired. We will send on approval to any collectors, so sure are we that you will be more than pleased.

Collections.

The Young Naturalist's Marvelous collection, consists of 44 specimens, as follows: Indian Pottery, Yellow Red and Black Sea Beans, Chinese Horn Nut, Egg Capsule Periwinkle, Sand Box Shuck, Alligator Tooth, Tarpon Scale, Jobs Tears, Black-eye Susans, Miamosa Seeds, Castor Oil Bean, Foreign Land Snail, Bleeding Tooth, Ring Top Cowry, Money Cowry, Teetarias, Olive, Worm Shell, American Fresh Water Shell, American Land Shell, Purpura, Limpet, Beehive Shell, Drill Shell, Button Shell, Satin Spar, Petrified Wood, Mexican Onyx, Petrified Coral, Petrified Nautilus, Petrified Shell, W. I. Branch Coral, E. I. Branch Coral, Yellow Coral, Organpipe Coral, Prescious Coral, Coralline, Yellow Sea Fan, Purple Sea Fern, Sponge, Starfish, Sand Dollar.

These are all Natural History Specimens and will delight the young and old as well. They are almost certain to create in any young mind a love for Natural History. Special prices to Teachers, where ordered in quantity for students. We send the collection prepaid with descriptive list of same, for only 60c.

Special Mineral Collection, consisting of 50 specimens of good size, as follows: Actinolite, Albite, Alabaster, Allanite, Aragonite,

Arsenopyrite, Asphaltum, Asbestos, Biotite, Beryl, Boltonite, Crystalized Calcite, Chalcedony, Chiastolite Crystal, Cone in Cone, Coquina, Crinoidal Limestone, Dolomite, Flint, Fossil Coral, Garnets in Rock, Geode Quartz, Gold Ore, Graphite, Gypsum, Hematite, Iceland Spar, Iron Pyrites, Kaolin, Lead Ore, Limonite, Marble, Magnetite, Mexican Onyx, Milky Quartz, Mica Schist, Nuttallite, Orthoclase, Petrified Wood, Porcelainite, Psilomelane, Pyrolusite, Pyrrhotite, Pyroxene, Satin Spar, Selenite, Silver Ore, Talc, Tourmaline, Wernerite.

These are all numbered to correspond with a list giving localities, etc. Special rates in quantity. Prepaid for 75c

Audubon Plate. We have one of Audubon's Plates of the Iceland Gryfalcon, nicely framed under glass. It is a beautiful thing for a library. Original price $25. Our special price, strictly net, $10.

Books.

We offer the following good books this month at wholesale prices. If you wish further information about any of them write us at once. All prepaid.

New England Bird Life, vol I, 300p, cloth, good as new..... $1 15
Agassiz Geological Sketches, 230p, cloth, good condition..... 81
Practical Zoology by Colton, 180p, red cloth, fine condition..... 55
How to Hunt and Trap by Batty, 200p, fair condition..... 57
Ferns of New England, 50p, new..... 50
Published Writings of Philip L Sclater, 140p, new..... 50
Tables for the Determination of Common Minerals, new 80p..... 90
Penhollows Vegetable Histology, 50p, new 60
Gray's School and Field Botany, 400p... 1 15
Handbook of Chemistry by Appleton, 250p..... 1 15
Spiders, their Structures and Habits, 120 pages, new..... 1 15
World Life or Comparative Geology, 600 pages, second hand..... 1 50
Bird Preserving and Bird Mounting..... 20
The Auk, Vol. 10, 400p, half leather, new 3 00
New York State Cabinet of Natural History, Vol. 3, 1850, colored plates.... 1 15
Frey's Compendum of Histology, 280p.. 1 50
Ridgeway's Manual of North American Birds, red leather, new, 650p, 124 full page plates, last edition..... 6 00
Coues' Key to North American Birds, second hand but as good as new, latest edition..... 6 00
Ords Zoology by Rhoads, 100p, new..... 90
Some Common Birds by Silloway, new, 330p..... 1 40
Bird Nesting by Ingersoll, new, 110p.... 1 10
The Ibis, Vol. 1, 1883, 5th series, rare, cloth..... 4 00
Ditto, Vol. 2, 1884, cloth..... 4 00
American Naturalist, Vol. 8, 1874, half leather..... 3 00
Agassiz, Structure of Animal Life, 130p, new..... 1 15
Elements of Chemistry, 500p, cloth..... 2 00
The Mysteries of the Ocean, translated from the French. 475p, gold edges, second hand, illustrated, cost $7,50. 2 50
Gray's Hand List of Birds, part 3, covering Struthiones, Grallæ and Anseres, all species in the world, 350p, new.. 2 00
Millner's Gallery of Nature, finely illustrated, 800p, cloth..... 3 00
THE MUSEUM, Vols. 1, 2 and 3, nicely bound in cloth, 700p..... 1 75
Ornithologist and Oologist, 1889 and '90, full leather, new..... 2 00
Capen's Oology, good copy, but second hand, rare..... 8 50
Tenth Annual Report of Bureau of Ethnology, 800p, weight 7lbs..... 2 50
Part 2 of Vol. 2 of Geology of Ohio, on Fossils, large volume with 60 full page plates..... 2 00
Standard Natural History, Vol. 1 on Lower Invertebrates, 400 pages, finely illustrated. This volume cannot now be purchased separate from set for less than $10..... 4 50
Cory's Birds of the Bahamas a fine work, new, cost $5..... 4 00

Any of above fine works sent prepaid on receipt of price.

Gem Stones.

Having purchased more of some kinds of these beautiful polished gem stones than we need, we offer them at the following prices:

Wood Agate, dozen..... $ 40
Tiger Eye " 30
Moss Agate " 50
Carnelian " 30
Malachite " 50
Bloodstone " 30
Ribbon Agate " 40
Gold Stone " 40
Black Agate " 40
Turquois " 50
Sample of each above 10 by mail..... 40
On an order for 12 dozen or more we will give a discount of 25 per cent. which is actual cost value.

New Mineral Collections for Teachers.

1. 40 Minerals in fine case, each specimen 1½x2½ in a tray, for illustrating mineralogy, net..... $2 00
2. 40 rocks in a fine case, each specimen 1½x2½ in a tray for illustrating mineralogy..... 2 00
3. 24 specimens of invertebrates, such as Foraminifera, Sponges, Corals, Worms, Starfish, Sea Urchins, Crustaceans, Insects, etc..... 3 50

The above 3 collections at $7.50 are the handsomest thing ever issued of the kind.

4. Consists of 20 minerals and 20 rocks in one case, being just half of Collection 1 and 2, net..... $2 00

Collection 3 and 4 at $5 50 will be found very useful.

We can guarantee above collections to suit any purchaser.

W. F. WEBB, Mgr.,
Albion, N. Y.

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talpa, L. 20 30	40
rhinoceros, Sby	1 00
irrorata, Sol	50
microdon, Gray	.50
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hirundo, L 5-10	20
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subviridis, Rve 35 50	.75
pulchella, Swain yg	.75
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erosa L 5 to	.15
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spurca, L. 20 to	.30
cernica, Sby	.50
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cervinetta, Kien	25
testudinaria, L 50 75 to	1 25
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THE MUSEUM.

A Monthly Magazine Devoted to Research in Natural Science.

VOL. V. ALBION, N. Y., OCTOBER 15, 1899 No. 12

THE MUSEUM.

A Monthly Magazine devoted to Ornithology, Oology, Mollusca, Echinodermata, Mineralogy and Allied Sciences.

Walter F. Webb, Editor and Manager

Albion, N. Y.

Correspondence and items of interest on above topics, as well as notes on the various Museums of the World—views from same, discoveries relative to the handling and keeping of Natural History material, descriptive habits of various species, are solicited from all.

Make articles as brief as possible and as free from technical terms as the subjects will allow. All letters will be promptly answered.

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Formalin as a Preservative.

During the past few weeks several persons have written me to ask how I use formalin and with what success. Encouraged by these letters and knowing how little has been written on its use, I take this opportunity of giving to the readers of the MUSEUM the results of my experience with formalin.

It was in the summer of 1895 that I first began to use this preservative. I was then located at Woods Holl, Mass., in the employ of a Marine Invertebrate Supply Department, and in the course of the summer we used over a hundred pounds. From that time to the present I have used formalin almost entirely, substituting it for alcohol whenever possible in order to save expense. In nearly every case I have found it satisfactory, and having "put up" very large quantities of material of all kinds in formalin I feel that I can honestly recommend it as a safe and thorough preservative.

I used to buy at the wholesale druggists what was labelled a forty per cent. solution of Formaldehyde. This was and is considered the same thing as one hundred per cent. Formalin and is mixed on a one hundred per cent. basis. Very recently I purchased some of the same make and I noticed that the label had been changed to read just Formaldehyde, this of course being identical with Formalin or Formol. In the report of the Department of Agriculture for 1896, I find the following sentence which applies to this: "Commercially, we find formaldehyde in the market as a 40 per cent. solution of the gas in water or wood alcohol under the trade names of formalin and formol." I mention these facts so as to avoid any confusion which might occur to a buyer unacquainted with the nomenclature, so to speak, of Formalin.

For nearly all purposes a three per cent. solution of Formalin is strong enough. This can be mixed by scale, with a graduate glass or simply by measure. Either way the results should be the same—thirty-two parts of water to one part of formalin. We will say that a pound of Formalin costs fifty-five cents, which is, I believe, the retail price at the present time. A pound of formalin is very near a pint and, when diluted to a three per cent. solution, makes thirty-three pints or over four gallons. How much cheaper than alcohol, which costs (commer-

cially pure) $2.50 a gallon and when diluted to seventy five per cent., the proper strength for a final preserving solution, costs about $2.00 per gallon. Formalin, too, in its concentrated form, occupies but little space, an added advantage to those who are going into the field to collect.

I have already stated that a three per cent. solution is strong enough for most purposes. In this strength I have preserved all invertebrates, with a few exceptions to be noted later, the smaller reptiles and batrachia, most fishes, many mammals and birds. In very few cases have I ever lost material unless through some oversight on my part as packing too closely, not properly injecting, etc. For sponges, medusae, tunicates, large reptiles and batrachians, large fish, mammals and birds, and as an injecting solution, I use five per cent. In my experience five per cent. formalin works better in these cases than three per cent.

Great care should be taken to inject all material, large enough to require it, thoroughly. For this purpose I use generally a bulb syringe with a glass tube fitted to it, and in some cases where an incision of any size would be detrimental to the specimen, a hypodermic syringe. Crabs should be injected through a hole made under the "purse" on the under side. Starfish may be injected through a hole cut in one ray. Nearly all the vertebrates should be injected through the mouth and anus and, if rather large, through one or more cuts on the abdomen. Medusae, sponges, tunicates, etc., will not need injecting. A little experience will teach the collector what specimens he must inject and what ones do not require it. In packing, specimens should not be crowded for the first day or two. After they have hardened a little they may be packed fairly close without danger of spoiling. I prefer to change formalin on those specimens where it has become much discolored and probably weakened by the juices of the body, and consider this a good rule to follow. This old formalin need not be thrown away, but can be used, strengthened a little if necessary, as a first bath or as a killing agent for other specimens.

It is not necessary to say that formalin should be kept in tightly closed receptacles as it will lose strength rapidly. Before going further I might say that it does not make much difference whether formalin is mixed with fresh or salt water, but I think the former a little the best. For marine forms, however, I use a great deal of salt water in mixing the formalin.

As regards the lasting qualities of formalin, I have specimens now that I put up in 1895 and they are keeping first rate. I see no reason why they should not keep so indefinitely, provided the containing vials or jars are kept tightly sealed or the formalin renewed at intervals of two or three years. There is, however, one objection to the use of formalin in large museums, where the temperature is apt to get down to the freezing point. The diluted Formalin will freeze and this may injure the specimens contained in it or perhaps damage the containing glass ware. I think I have seen this objection spoken of in the report of one of our large museums.

As a killing agent Formalin acts rather violently. Crabs are apt to cast their claws when immersed in it and it is better to kill them in most anything else. I have tried it as a killing agent on sea cucumbers (Thyone) but without much success. The worms do not kill well in it. Three are some things, however, like the medusae and many of the tunicates, which can be dropped directly in five per cent. formalin with good results. For reptiles and batrachians, fish, etc., it answers very well. Bright colors are almost sure to disappear in formalin, though on some things, as snakes for instance, it holds the color very well.

Before closing I wish to say a few words about the ill effects arising from the use of formalin. No one to my knowledge ever got into the near vicinity of an open bottle of Formalin without noticing the irritating effect which it causes on the mucous membrane. This irritation one becomes hardened to after enduring it for a time and it ceases to annoy much. Formalin will also get into cuts and "raise cain." It causes irritating sores, which seem to spread day by day unless the hands are kept out of formalin or rubber gloves used to protect them. It also "tans" the skin making it tough and rather black, and a person's hands after a few weeks' steady acquaintance with Formalin are generally in no condition to be exhibited at a whist party. This injury to the hands may be remedied in part by the use of rubber gloves, but rubber gloves are rather expensive, easily damaged and rather clumsy. As a rule the only time that one needs to get his hands much in contact with formalin is when injecting, and in ordinary collecting there is not much of this to be done. It is only when one has to inject large quantities of material day after day that the hands suffer so much.

If there are any points in regard to the use of Formalin, which I have not yet made clear, I shall be glad to do so at any time provided I am able. I should also like to hear any additional remarks from others on this interesting subject.

F. P. Browne.

Plenty of Work for Young Explorers.

It is most important that the young explorer should start out in the right direction, for there are several kinds of explorers and it is quite worth while to become one kind and hardly worth the outlay of time and trouble to become one of the other kinds. To explore, we are told by our dictionaries, signifies "to search or pry into; to examine by trial; to inspect carefully." It is the first and last of these definitions that appear to me to best cover what I want to impress on my readers, viz: that to pry into and to inspect carefully is the true way in which exploration should be carried on. And, further than that, that anything less than that is exploration but in name.

When I speak of explorers, probably most of my readers think at once of Stanley and Peary, and Sir Samuel Baker, and few think of Bates and Whymper, and Wallace. Yet it is of the latter that I wish to speak as the true types of the sort of explorers who leave behind them the greatest amount of work that was really worth the doing. Not that the name of Stanley will not always be closely connected with the exploration of Africa, nor that Peary's name will not always occupy a place among Arctic explorers, but they will both of them be remembered for what they failed to explore quite as much as for what they discovered; and there will always be the feeling in the public mind that, had it not been for the money-getting and fame-earning lecture platform and the books that were to follow, these explorations would never have been made. But it is an undeniable fact that the man who goes out to a new land with these motives before him is far too likely to be in search for the remarkable and startling to give patient attention to the little minutiæ that are in reality of much greater importance. For it is beyond dispute that it is the things that the so-called explorer who goes through the land with a blare of trumpets and an army of attendants never sees that bring lasting credit to the conscientious observer who cares nothing for the applause of the unthinking multitude, but everything for the good opinion of those of his fellows in science who are best able to judge of the value and permanence of his work.

Bates, who after eleven years of the most painstaking work in the Amazonion wildernesses, came back to England

and fame the same retiring, modest, and thoroughly unspoiled man that he had been when he went away, tells us of the wonderful amount of work that he did for pure science in a manner that is as direct and unassuming as though he was narrating the most ordinary matters. Whymper, after 219 days and nights in such inhospitable and dangerous elevations as only the Andean explorer can appreciate, comes back to civilization so impressed with the importance of comparing his work with that already done by others, that nine years pass by before he considers it time to give to the world the facts of his explorations in the Equadorean Andes. Wallace spent many of the best years of his life in researches that have given the world some of the most brilliant theories concerning the animal and vegetable kingdoms that have ever been brought forth, and at the same time was busy in gathering a vast store of facts that have been a perfect well-spring from which the botanists and zoologists of all christendom have drawn many of their choicest material. It is the explorer who explores who is wanted to-day and who has always before him the assurance that his work will be appreciated where appreciation is worth the having.

But, I hear some of my readers say, how do you expect us to go away from home and parents and school and copy the achievements of these men who thus spent years away from civilization? To which I reply that there is another sort of explorer who is quite as worthy of emulation as these of whom I have last spoken. To this class belong such names as White, who, around his home at Selbourne, did so much toward unraveling the secrets of nature that there presented themselves to him. And again, we have our own Thoreau, to whom the simple cabin life in a New England woods was of greater charm than the brilliant society that he was sure to meet in his own home, because, as he tells us, the dwellers in that woods—the squirrels, the birds, the reptiles and the insects—were to him worthier of study and more profitable as companions than their more pretentious relative, man. And to-day we have our Borroughs and our Abbott, letting no chance slip by them to see more of nature, not as she is to be seen in the bleak north or the sweltering south, but just as she is and is so little understood here at home, and telling us of their discoveries as no others can. I speak of these at-home explorers in this way because I take it for granted that all my readers are acquainted with their writings, and, that if some there be who are not, they will quickly remedy the defect—for defect it is.

So when I speak of the work that awaits young explorers—and it is a very important work of which I am writing, if it be well done—I mean exploration around home. There is no need to shrug the shoulders in the feeling that around your home there cannot be yet remaining that which is undiscovered, for it is quite safe to say that in the most thickly settled neighborhoods in our lands there is more to find out and to communicate for the good of science than has yet been discovered about the region.

Everywhere, even in our thickly settled eastern states, there are many curious, and even wonderrul things, that have never been noticed by people of intelligence, and consequently remain undescribed.

It is of just this sort of exploration that I am writing, and of the importance of which I wish to convince my readers

Though not so enticing to many, the explorations that have to do with the animal and vegetable life of any given region are by no means of the least importance. Setting aside the mere hunt after the plants or the animals that are valuable in medicine or the arts as not so likely to be of value in our land, and as a least noble sort of exploration at the best, let us consider the kind of inquiry into our immediate neighbor-

hoods that it is worth our while to enter into. We will begin with the plant life because it will take but a short space to dispose of that branch of the subject, partly because there has been so much more done in botany than in zoology, and partly because I know far less of the needs for exploration in that direction. However, I do know that in what our scientific friends call Cryptogamic Botany, that branch of the study to which the ferns, the mosses, the lichens, and the countless world of microscopic plants to which the smuts, the mildews, and all their tiny horde belong, there is much of interest to be gleaned. But this is hardly work that will appeal to the juniors while they remain such, for it calls for too much of indoor work, too much of long and patient bending over a microscope, to be very enticing. To those who have a garden, where without too much expense an electric line can be tapped, there is a field of prying into—which was one of the definitions of to explore—which holds out much of promise in the way of experimentation with the electric current and plant life. Professor Aloi and others have shown that electricity may be made to exert a very beneficial influence on certain vegetables on which they have conducted experiments. Corn planted in the usual way and treated as is commonly done on our farms is much hastened in its development and its yield is increased, it is claimed, if an electric current is sent through the ground near its roots. Other vegetables have been effected in like manner and some wild flowers have been induced to so far excel their usual size and beauty as to rival their hot-house cousins. Here is a field for inquiry for the suburban boy that is full of suggestiveness; and, perhaps, it is even a better field for his more painstaking and flower-loving sister.

In conversation with one of the students of mammals in the National Museum at Washington, not long ago, I was much surprised to find how much there was yet to be found out about the commoner mammals of our eastern states. It appeared as though there was hardly a species that had not some unsolved problem connected with it, and to one who like myself had always imagined that the mammals of this region were studied until they had been reduced almost to an exact science, it was strange to learn that there was yet so much that the students of that animal class were waiting to find out. There was more to be known about the moles and their habits underground than had yet been discovered. Although the varieties and structural peculiarities of the skunks were well known, but little was certain as to their home life, although that seemed quite natural to me, and will, doubtless, seem so to my readers. And so it ran on through the catalogue of the lot.

Marsupialia or Marsupiata.

(Purse or Pouch.)

A great many of our zoologists of the present day, class the Virginia Opossum as a distinct group of the mammalia. They differ essentially from all others in their organization. Some 'possum are insectiverous or carniverous in their habits, others herbiverous and still others frugiverous. Some are diurnal and others nocturnal. The marsupial animals are all restricted to two portions of the globe—America and Australia—including certain islands in the Indian Archipeligo. Upwards of 70 species are known.

The genus Didelphys is a genus of which the Virginian Opossum (Didelphys virginiana) is restricted to America. It contains some twenty species, a few of which are very small. The limbs are short, the feet plantigrade, five toes on each foot, armed with strong curved claws, except the inner toe on the hind feet. The sole is covered with a naked skin which is sensative. The tail is naked or scaly except at its base, and constitutes an organ of prehension, but not to the

same extent in all species. The ears are large, thin, naked and rounded. The tongue is thick and rough with horny papallae. The snout is long, the muzzle pointed, naked and moist. The females have a pouch, in which they carry their young.

The Virginia Opossum and its immediate relations are slow and nocturnal in their habits. They live mostly on branches and in hollow trees and remain torpid throughout the day.

At night they prowl around and feed on insects, eggs, birds, reptiles, and small animals, adding also fruits and roots to their diet. Their sense of smell is of high perfection. Like the English Polecat it is fond of poultry, although not very lively and retreats before the break of day, leaving its victims behind.

The Virginia Opossum is common in many parts of North America from Mexico to Massachusetts. Specimens have been shot near Haverhill, Mass. This is as far north as I have any reports that I place any faith in, although it may range still farther north.

It is about the size of a common house cat, being about 22 inches in length from end of nose to roots of tail. The tail is 15 inches long. The under fur is deep and wooley. The color of fur and hair may change as to locality where taken. I simply described the general color.

The ears are large and black, margined on the tips with white.

The scaled portion of the tail is of a whitish tint. The general color of the fur is a dirty white with a slightly yellow cast. The legs are dusky brown, a tint of which surrounds the eyes.

There is nothing pleasing in the appearance or habits of the Virginia Opossum. In captivity I find it very dull and sloathful and soon becomes very fat, eating both vegetable and animal food.

As to cunning, it shows very little when in captivity and is to my mind a very uninteresting pet.

In its wild state it suffers from both birds and animals, as well as from man. It is hunted for its fur, fat and for its flesh. Nothing to my knowledge will awaken a southern darkey as a Posum hunt, and perchance he may get a skunk instead, as I have to my sorrow more than one.

I have noticed that as soon as the Opossum discovers the approach of its enemies, it hugs close to the branch or gets into a crotch where two limbs seperate, but if the hunter has a good coon dog he is soon discovered, and is shortly shaken out or shot. But the dogs have good cause to be very smart or he will quickly disappear. They will feign death to a remarkable degree and even after placed in the bag will sometimes not be found when the hunter returns home. They even have more lives than the cat, it would seem, for I have shot them with charges that would kill an animal three times as large, and after placing them in the canooe have seen them try to sneak out over the gunwale when they thought themselves unobserved. It will, when shaken from a tree, steal away and compress itself into a very small space, hoping to elude capture; and will also assume the attitude and stillness of death. This, under the shade of night, will often enable it to escape the dogs.

I have noticed that the old Opossum will often be seen with its entire family of youngsters on its back and they to prevent a fall will have their tails tightly wound around their mother's, and otherwise stand on her back. She will go through the branches thus laden with ease, and the family seem to enjoy the ride. This is, no doubt, a method of the old one to land her offspring in a place of safety when danger threaten them.

Their flesh is white and they are not bad eating at all. They climb with great facility and will hang suspended by their tail for considerable time. They also will hang thus by their tail and swing back and forth and suddenly throw themselves from

one branch to another some distance away, on which they will safely land.

Now as to the amount of a litter of young, I wish to state that I am not positive. I do know that they will have 6 or 8, but I have been told by southern parties that ought to know, that they have as high as 15 at a time. But this I care not to say as a fact, but can say 8, as I have often found that many in a nest.

The nest is generally in a hollow tree, well lined with grass. They also build in fallen trees and under old stumps, holes in banks and any dry place.

When born they are not covered with hair, but while in the pounch it begins to grow and they open their eyes after 40 or 50 days. This I quote from others and ask some of the readers if they can throw any more certain light on it. I hardly think this correct, but have not had a chance to verify it, so leave it for somebody that has had an opportunity.

Last summer I secured a pair of Opossum and intended to place them in a suitable inclosure so as to study this matter, but the Opossums thought better of it and departed in the night. Whether they both got safely away or not our Mollie, a black bear, could say, as they had to pass through her pen to do so, and she is a very inquisitive bear. But the boys say that they have seen young Opossums no bigger than small rats around the old lumber stored under one of the barns, so I imagine the female escaped and had a litter. Tracks of Opossums have been seen in the mud in a thick woods near here, so I imagine that they are still living.

CHARLES NEWELL,
West Newbury, Mass.

William D. Hartman, M. D.

The October number of the Nautilus contains a notice of the death of Dr. Wm D. Hartman, and believing him to be one of our most prominent students of Conchology, we reprint here portions of said notice.

Dr. Hartman whose death occurred on August 16th last, at West Chester, Pa., was born in East Pikeland Township, West Chester, Pa., Dec. 24, 1817. He was the eldest son of Hon. George Hartman. The founder of the family in Chester Co. was his great-great-grandfather, John Hartman, a native of Schwerin, Hesse Casse, Germany, who came to Philadelphia in 1753.

After receiving an education in the schools of the neighborhood, Wm. Hartman entered the famous school of Jonathan Gause and the academy of Jonathan Strode. He studied medicine and about this time became greatly interested in the study of Botany. He attended the University of Pennsylvania and graduated from the Medical Department in 1839, at the age of 21 years. After graduation he returned to West Chester and engaged in the practice of his profession.

Dr. Hartman devoted all the time that he could spare from his medical practice to the study of Natural Science. □ Besides botany he studied entomology, mineralogy and conchology, and became an authority in each of these branches, especially as they related to Chester county. The latter science, however, finally engrossed his attention, and it is by his work on Mollusca that he became most widely known. For over forty years he corresponded upon conchological topics with the leading authorities in the science in this country and abroad. Among his correspondents and co-laborers were Isaac Lea, L. L. D., of Philadelphia, Charles Wheatley of Phoenixville, Geo. W. Tryon, Jr., J. G. Anthony, Dr. J. C. Cox, Andrew Garrett, W. H. Pease, E. L. Layard and others.

Through Mr. Garrett he obtained what is perhaps one of the finest collections of Polynesian land shells in the world, especially of the genus Partula, of which he described 25 species.

The original study of the genus Partula particularly engaged his attention during several years; and his careful work and extensive writings on the group have given him high rank as an authority thereon. His beautiful collection of Achatinellidæ was purchased by the Bremem Museum some time before his death. The last Conchological work that Dr. Hartman undertook was a revision of the Helicinidæ. He gathered much interesting material but failing health prevented the carrying out of his intentions.

One of the best known publications from the pen of Dr. Hartman was Conchologia Cestrica, treating of the Mollusca of Chester Co., Pa. In its preparation he was associated with the late Dr. Ezra Michener of New Garden Township, but Dr. Hartman did the larger part of the work. It is illustrated with 200 wood cut figures of shells described in the work. This book published in 1874 was formerly used as a text book in many schools in Chester and Delaware counties.

He was also the author of the following papers:

Opercula of the family of Strepomatidæ. Amer. Jour. Conch. vi. 316, 1871.

Description of a Partula supposed to be new, from the island of Moorea, Proc. Acad. Nat. Sci. Phila. 229, 1880.

A Catalogue of the Genus Partula, Fer. Privately printed in West Chester, 1881.

Observations on the species of the Genus Partula, Fer., with a Bibliographical Catalogue of all the species. Bull. Mus. Comp. Zool. ix, No. 5, pp 171-190, 1882.

Observations on the duplicates of the Genus Partula, Fer., contained in the Museum of Comparative Zoology, Cambridge, Mass., formerly belonging to the collection of the late W. H. Pease, Bull. Mus. Comp. Zool. ix, pp 91-96, 1882.

Descriptions of new species of Partula and a synonymic catalogue of the genus. Proc. Acad. Nat. Sci. 203-223, 1885.

New species of Partula from the New Hebrides and Solomon Islands. Proc. Acad. Nat. Sci. 30-35, 1896.

A bibliographic and synonymic catalogue of the genus Achatinella, Proc. Acad. Nat. Sci. 16-56, 1888.

New species of shells from the New Hebrides and Sandwich Islands. Proc. Acad. Nat. Sci. 250, pl. 13, 1888.

New species of shells from New Hebrides. Proc. Acad. Nat. Sci. 91-95, pl. 5, 1888.

Descriptions of new species of shells. Proc. Acad. Nat. Sc. 284-288, pl. 3, 1890.

Catalogue of the genus Partula. The Nautilus, vi. 73 and 97, 1892.

Melania yokohamensis, new species, The Nautilus xi, 41, 1897.

In 1883 Dr. Hartman went abroad visiting many of the leading museums.

He was married to Mary Jane Kabel, a daughter of John Kabel of Jefferson Co., W. Va., on Dec. 3, 1841. Mrs. Hartman survives her husband, as also do five children.

(In July last we had the pleasure of calling on Dr. and Mrs. Hartman, only about a month prior to his sudden death. Although the Doctor was feeling very miserable, as soon as I made myself known he insisted on showing me his entire beautiful collection, which is arranged in over 100 large draws. It covers to more or less extent all genera of shells, but one can readilly see his favorites were the East Indian Land Shells. All the specimens are beautifully mounted on cards, similar to most of those in the Academy of Natural Science at Philadelphia. It was a treat greatly enjoyed and long to be remembered.—ED.)

DAGGER LIKE SWORDS—We have a stock of dagger-like swords, 20 to 30 inch blade in fine sheath, fancy handle at $1.00 each net by express. They are a bargain at this price. No rust on them. W. F. WEBB, Mgr., Albion, N. Y,

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Sandhill Crane, fine plumage $3 25; Long-billed Curlew, $1; Red throated Loon, $1 10; Cassin's Auklet, $2 35, Pacific Fulmar, 2 75; Bahama Pintail $1 25; Ross' Snow Goose, $4; American White fronted Goose, $1 60; White Ibis, $1 50; Chaetura, $1; Zone tailed Hawk $2 American Rough legged Hawk $1 25; Snowy Plover, 70c, Townsend's Junco, $1.35; Black Swift, $2 35; Leconte's Thrasher, $1.

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We offer them while they last as follows:

Doe heads, pretty,	$ 4 00
Buck " fair size,	7.50
" " large "	10.00
" " extra large,	12 50
Caribou Heads, fine,	18 00
Moose, handsome,	48.00

Write us at once if you want any of the above.

We will exchange any of them for specially rare eggs or other specimens we need

W. F. WEBB, Mgr.,

Albion, N Y.

WANTED —Sets of any Warblers, Hawks, Owls, Waders, Game birds, Water-fowl, Sparrows Can offer good trade as 362, 187, 341, 117, 269, 493 Send list. D. WILBY, 27 Front street, west. Toronto, Ont.

Flint Ridge Implements.

These are known all over the U. S for their finish, color, and beauty. The Flint Ridge Knives, Arrows, Spears, Scrapers, etc, were carried by aborigines all over the country. Send me $1 for a sample lot.

CLIFFORD ANDERSON,

BROWNSVILLE,

Muskingum Co., OHIO.

Re-Enforcements.

THE NATURALIST, FARM & FANCIERS REVIEW

Has been Re-enforced and will be further Re-enforced. The following Departments have been Inaugurated, and each will be Edited by Prominent parties:

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Our New Lot of Fossils.

The new lot of fossil shells advertised in last MUSEUM are going rapidly. One complete set has been sent to the British Museum at London and another set will go to Germany. We still have a pretty good assortment As intimated in our advertisement they would go quickly and they have No one could collect the assortment of specimens we offered, name them correctly and make living wages at our prices

We can still offer a fine assortment of 50 to 60 species, which includes most all the largest specimens many ranging 6 to 8 inches, a fine suite of at least 150 specimens for only $15.00.

Every museum that has not a set of nice Pliocene Fossils should have them represented. It will not be possible to get them at a less figure unless they are donated outright.

We also offer some nice specimens in exchange for specimens of shells we can use.

W. E. WEBB, Mgr.,

Albion, N. Y.

A NEW LOT OF FOSSILS.

While on our recent trip south we secured a fine lot of Pliocene Fossils, taken in the vicinity of the Caloosahatchie river in Florida This is a region that has had few explorers after fossils and the results are that the specimens possess great interest. The quality of the specimens is also good, much better than is usually the case with fossils of this nature. The species have all been carefully gone over by the curator of one of our leading Pennsylvania museums, carefully sorted up and accurately named. To our notion, fossils are of little value without a name and locality.

These specimens were secured at a usual depth of twenty feet below the surface of the ground. They are fully written up in the proceedings of the Wagner Free Institute, by Prof. William H. Dall, of the Smithsonian institution, of Washington, D. C Any collector having access to most any of our larger museums will find the above proceedings and illustrations of the species.

We offer single specimens at very reasonable prices, or will make up into collections, as follows:

Collection of 50 species, representing a large number of genera, all carefully labeled for $4.00.

Collection of 75 species, all carefully labeled $7.50.

Collection of 100 species, all carefully labeled $10 00.

Collection of 200 species, all carefully labeled $30 00.

Collection of 200 species, giving suites of each kind, usually of from 3 to 5 specimens, in all aggregating over 750 specimens, for $50.00, which is at the rate of only seven cents a specimen.

At the above figure no man can afford to go to Florida to collect these interesting specimens. We are told that less than ten museums in the United States possess a series of the above specimens, and unless secured within the past year, the British museum does not possess a series from the above locality.

A large proportion of these will be sold almost immediately on the appearance of this advertisement, hence you should write at once if you wish to secure any of them.

WALTER F. WEBB, Mgr., - - Albion, N. Y.

BROOKDALE MUSEUM,

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Collectors and Dealers in

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TAXIDERMY IN ALL ITS BRANCHES. Write us for quotations on anything in our line. We can furnish anything obtainable in large or small lots, and you will find our prices as low, if not lower, for the quality of goods, than anybody's.

CHARLES NEWELL, President.

SHELL SUITES—We offer 50 kinds of American Helix at $2.00 prepaid, 50 kinds of Foreign Helix at $4 00 prepaid, 30 kinds of Achatinella, $3.00, 20 kinds Partula at $2.50, 100 kinds of American Fresh Water shells, mostly Strepomatidie, at $4 00 prepaid, 100 nice kinds of Marine Shells many genera from all parts of the world at $7 50 prepaid, 50 kinds of Foreign Fresh water shells at $5.00, 100 kinds Foreign Land Shells exclusive of Helix for $8 00 40 kinds of Clausilia for $2.00, over 100 other similar bargains by families. Let us hear from you All specimens carefully labeled with name, locality, etc. W. F. WEBB, Mgr., Albion, N. Y.

CHOICE INDIAN RELICS:—We expect in the near future a large and fine collection of Indian Relics. Among other interesting things are 900 flint arrow points, 120 white quartz points, 200 bird points, 115 spear heads of all sizes, 60 scrapers, 40 bone awls, 40 hoes, knives, gouges and disks, 30 drills, many bone, stone and shell beads, 100 stone and slate implements of curious designs, pipes, etc. Parties who wish some of these fine and unique specimens should write at once; first come, first served. W. F. WEBB, Mgr., Albion, N. Y.

October Bargains.

We are cutting prices in many cases way below cost to close out the greater share of our large stock. Some branches of our business will be dropped entirely. We offer you extra inducements to buy now. Remember no poor stock will be sent out unless distinctly understood in advance.

Bird Skins at Reduced Prices.

Postage extra if you wish sent by mail.

Evening Grosbeak..... .28
American Quail, female..... .30
Great Blue Heron, male..... 1.00

Following from South Texas, made in February and March last:

Road Runner, m..... .46
Arizona Cardinal, m. f..... .19
Western Meadow Lark, m..... .19
Sage Thrasher, m..... .24
Mexican Shore Lark, m..... .14
Amert Titlark, m..... 12
McCown's Longspur, m..... .12
Black-throated Sparrow, m..... .18
Black Skimmer..... 55
Gull-bill Tern..... 70
Long-bill Curlew..... 55
Western Nighthawk..... 38
Scaled Quail..... .55
Texan Quail..... .38
Vermillion Flycatcher..... .34
Cassin's Sparrow..... .45
Clay-colored Sparrow..... .25
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Cracked Ostrich Eggs.

In the handling of over 100 dozen Ostrich eggs we found a great many specimens cracked slightly. Some you would have to hunt quite a while to find the imperfection. They are just the same as we have been selling for one year, only for the cracks. Per dozen $2.00 Single specimen net 20c or prepaid 45c. Perfect Ostrich eggs are now worth $6 00 a dozen.

Indian Relics and Curios.

Fine Bowl, cracked..... 2.50
Sinkers..... .15
Scrapers, notched or unnotched..... .15
Points, poor, various states..... .01
" better, " " ..... .03
" good to fine, various states..... .10
Chautauqua shell collection, used to sell at $2.50, prepaid, have 10 will sell at..... 1.25
Cactus Wood Cane..... .50
Collection of 50 kinds of minerals, all named, etc..... .75

Special rates on 25 to 50 collections.

Ostrich Egg, African..... .85

A bargain on some big Bahama Corals weighing 10 to 40 pounds each.

Marine algae per doz. cards..... .75
Scorpion, mounted in box..... .40
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12 kinds of Sea Beans, all named, for..... .30
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Birds of Labrador, Natural History of Labrador, and O. & O. Manual, all for. 1.00
Book of Sea Mosses, 10 beautiful cards, all different, arranged in a book and tied with ribbon The finest work in the mounting of sea mosses we have ever seen..... .60
Ditto, large size, fine..... 1.20
Marine Algea Blotter, the top card with beautiful mountings and covered with celluloid. Very neat..... .40
Marine Algea Newspaper Clipping Case, 6 large envelopes appropriately named and bound in heavy covers, on which are beautiful mounts under celluloid, so it is not easily soiled, gold edges... .75
Marine Algea Panel, consisting of 5 card mounts, strung with ribbon, so as to hang on wall. This is to our notion one of the handsomest..... .40
Marine Algea Photo Frame. The frame proper is covered with beautiful mounts that are in turn covered with celluloid to keep dust from soiling. Has back, so will stand on mantel or table. A beauty..... .60
Shell Case, a pair of Pecten irridans, hinged at bottom in which are 10 cards of algea, very neat..... .40

The above seven articles are particularly suitable for birthday or wedding gifts, being something that will be always admired. We will send on approval to any collectors, so sure are we that you will be more than pleased.

Collections.

The Young Naturalist's Marvelous collection, consists of 44 specimens, as follows: Indian Pottery, Yellow Red and Black Sea Beans, Chinese Horn Nut, Egg Capsule Periwinkle, Sand Box Shuck, Alligator Tooth, Tarpon Scale, Jobs Tears, Black-eye Susans, Miamosa Seeds, Castor Oil Bean, Foreign Land Snail, Bleeding Tooth, Ring Top Cowry, Money Cowry, Tectarias, Olive, Worm Shell, American Fresh Water Shell, American Land Shell, Purpura, Limpet, Beehive Shell, Drill Shell, Button Shell, Satin Spar, Petrified Wood, Mexican Onyx, Petrified Coral, Petrified Nautilus, Petrified Shell, W. I. Branch Coral, E. I. Branch Coral, Yellow Coral, Organpipe Coral, Prescions Coral, Coralline, Yellow Sea Fan, Purple Sea Fern, Sponge, Starfish, Sand Dollar.

These are all Natural History Specimens and will delight the young and old as well. They are almost certain to create in any young mind a love for Natural History. Special prices to Teachers, where ordered in quantity for students. We send the collection prepaid with descriptive list of same, for only 60c.

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These are all numbered to correspond with a list giving localities, etc. Special rates in quantity. Prepaid for 75c

Audubon Plate. We have one of Audubon's Plates of the Iceland Gryfalcon, nicely framed under glass. It is a beautiful thing for a library. Original price $25 Our special price, strictly net, $10.

Books.

We offer the following good books this month at wholesale prices If you wish further information about any of them write us at once. All prepaid.

New England Bird Life, vol I, 300p, cloth, good as new..... $1 15
Agassiz Geological Sketches, 230p, cloth, good condition..... 81
Practical Zoology by Colton, 180p, red cloth, fine condition..... 55
How to Hunt and Trap by Batty, 200p, fair condition..... 57
Ferns of New England, 50p, new..... 50
Published Writings of Philip L Sclater, 140p, new..... 50
Tables for the Determination of Common Minerals, new 80p..... 90
Penhollows Vegetable Histology, 50p, new 60
Gray's School and Field Botany, 400p... 1 15
Handbook of Chemistry by Appleton, 250p..... 1 15
Spiders, their Structures and Habits, 120 pages, new..... 1 15
World Life or Comparative Geology, 600 pages, second hand..... 1 50
Bird Preserving and Bird Mounting 20
The Auk, Vol 10, 400p, half leather, new 3 00
New York State Cabinet of Natural History, Vol. 3 1850, colored plates.... 1 15
Frey's Compendum of Histology, 280p.. 1 50
Ridgeway's Manual of North American Birds, red leather, new, 650p, 124 full page plates, last edition..... 6 00
Coues' Key to North American Birds, second hand but as good as new, latest edition..... 6 00
Ords Zoology by Rhoads, 100p, new 90
Some Common Birds by Silloway, new, 330p..... 1 40
Bird Nesting by Ingersoll, new, 110p.... 1 10
The Ibis, Vol. 1, 1883, 5th series, rare, cloth..... 4 00
Ditto, Vol. 2, 1884, cloth..... 4 00
American Naturalist, Vol. 8, 1874, half leather 3 00
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Having purchased more of some kinds of these beautiful polished gem stones than we need, we offer them at the following prices:

Wood Agate, dozen ..... $ 40
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Sample of each above 10 by mail..... 40

On an order for 12 dozen or more we will give a discount of 25 per cent. which is actual cost value.

New Mineral Collections for Teachers.

1. 40 Minerals in fine case, each specimen 1½x2½ in a tray, for illustrating mineralogy, net..... $2 00
2. 40 rocks in a fine case, each specimen 1½x2½ in a tray for illustrating mineralogy..... 2 00
3. 24 specimens of invertebrates, such as Foraminifera, Sponges, Corals, Worms, Starfish, Sea Urchins, Crustaceans, Insects, etc..... 3 50

The above 3 collections at $7.50 are the handsomest thing ever issued of the kind.

4. Consists of 20 minerals and 20 rocks in one case, being just half of Collection 1 and 2, net..... $2 00

Collection 3 and 4 at $5.50 will be found very useful.

We can guarantee above collections to suit any purchaser.

W. F. WEBB, Mgr.,
Albion, N. Y.

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There are very few shell collectors but what will agree that the Cowries are the handsomest of all shells. The brilliant enamel extends over the entire specimen and the great variety of colors are really wonderful

They inhabit chiefly the warmer seas, although a few species come as far north as Florida and southern California. The Indian ocean produces more kinds than any other locality, although they inhabit all islands from Japan to New Zealand. Our new possessions, the Sandwich Islands, have a number of interesting forms.

We list such species as we have on hand at present and shall be pleased to send approval lots to any one who desires same. The difference in price usually denotes a difference in size, as we have NO POOR specimens whatever. You are sure to be pleased with anything from this list.

LIST AND PRICES.

Argus, L. 50. 75 to	$ 1.00
exanthema, L. 15. 25 to	50
scurra, Chemn., 25 to	50
isabella, L. 5-10	.15
lurida, L. 10 and	.15
Cinerea Gmel. 10 20	.50
carneola, L. 10 20 30	.75
talpa, L. 20 30	.40
rhinoceros, Sby	1.00
irrorata, Sol.	.50
microdon, Gray	.50
felina, Gmel. 10 and	.20
hirundo, L. 5-10	20
neglecta, Sby.	.15
cynindrica Born. 35	.50
teres, Gmel.	2.00
cruenta, Gmel. 10 15	.20
stolida, L.	.50
arenosa, Gray 35 to	.50
tessellata, Swain $1.00 to	2 50
caput-serpentis, L. 5-10	.15
Arabica, L. 15 20	.25
reticulata, Mart. 20 30	50
histrio, Meusch. 30 40	.50
stercoraria, L. 25 to	.50
decipiens E A S.	10.00
moneta, L. & Vars. 5 to	.15
obvelata, Lam. 10 to	.15
Aurantium, Mart. with hole in outer lip, worn by native	25.00
Tigris, L. 15 to	.25
vitellus, L. 10-15-25	.50
spadicea, Swn. 50 75	1.00
pyrum, Gmel, fine	.35
errones, L. 5 10	.15
subviridis, Rve 35 50	.75
pulchella, Swain	2.50
zonata, Chem. $1.50 to	2.50
picta, Gray. 25 to	.50
punctulata, Gray	.15
ziczac, L. 5-10 to	.15
asellus, L. 5 to	.10
punctata, L. 15 to	.25
Comptoni, Gray	.50
pulicaria, Sve.	1.00
cribraria, L. 25 35 and	.50
esentropia, Ducl	1.00
Lamarckii, Gray. 20 to	.35
eburnea, Barnes. 30-40 to	75
erosa, L. 5 to	.15
listeri, Gray. 50 to	.75
albuginosa, Mawe	.15
polita, Roberts	2.00
spurca, L. 20 to	.30
cernica, Sby	.50
edentula, Sby.	.40
capensis, Gray	1.25
cervus, L. 25 50 to	.75
cervinetta, Kien	.25
testudinaria, L. 50-75 to	1 25
controversa, Gray	50
pulchra, Gray $1.50 to	2 00
reevei, Gray.	1.50
interrupta Gray	.40
quadrimaculata, Gray	.50
fimbricata, Gmel. 5-10	.20
maculu, Ads 35 and	.50
ursellus, Gmel.	.15
oweni, Sby	1.00
cöffea, Sby	.50
tabescens, Sol. 25 35	.50
caurica, L. 5 10	.20
gregori, Ford.	50
ventriculus, Lam. 25-50	.75
mauritiana, L. 25 to	.40
mappa, L. 50-75-$100	1.50
eglantina, Duc.	2 00
intermedia, Gray	.15
arabicula, Lam. 15 to	.25
stercoraria, Var. Minor	.30
thersites, Gask	2 50
mus, L.	.30
annulus, L. 5 to	.10
pantherina, Sol. 25 to	.50
melanostoma, Leathes. 50 75	1.00
onyx, L. fine	.50
lynx, L. 5-10-15-25	.50
sophiae, Braz.	1.00
pallida, Gray	1.50
Sowerbyi, Kien. 20 to	.35
Exusta, Sby. very fine	10 00
sanguinolenta, Gmel.	.75
undata, Lam. 10-15 to	.20
clandestina, L. 5 to	.10
angustata, Gmel. 25-35 to	.50
piperita, Sol.	.75
algoensis, Gray	.50
cribellus, Gask	.30
margarita, Sol.	2 00
miliaris, Gmel. 25 to	.40
turdus, Lam. 5 to	15
ocellata, L. 10 to	.15
poraria, L.	.15
helvola, L. 5 to	.15
semiplota, Migh	2.00
flaveola, L. 15 to	.25
gangrenosa, 5 to	.25
adansoni, Gray	1.00
staphylaea, L. 10 to	.20
pustulata, Lam. 15 to	.25
Madagascarensis, 35 to	.50
annulata, Gray	.50
globulus, L.	.25
oniscus, Lam.	.40
nivea, Gray	.10
scabriuscula, Gray	.10
insecta, Migh	.15
globosa, Gray	.25
suffusa Gray	.15
quadripunctata, Gray	.10

radians, Lam	.25
californica, Gray	.10
subrostrata, Gray	.30
formosa, Gask	.50
australis, Lam	.25
annae, Roberts	1 00
sub-cylindrica, Sby	.60
nucleus, L. 10 to	.20
granulata, Pse	.50
cicercula, L	.20
childreni, Gray	.25
ovulata, Lam	.75
oryza, Lam	.10
grando, Gask	.75
vitrea, Gask	.75
pediculus, L	.10
Pacifica, Gray	.15
exigua, Gray	.75
solandri, Gray	.15
sanguinea, Gray	.10
pellucidula, Gask	.50
europea, Mont	.10
pulex, Sol	.10
clara, Gask	1.00
gemmula, Weink	10.00

In addition to the above we have a number of varieties of fossil Cypraea, something in very few collections in this country. One of the most curious forms is probelamtica, Helip, from Pliocene, Fla., $1. No such Cypraea exists to-day. Other good species are amygdadum, Brocchi. Turin 60c, brocchi, Desh. North Carolina 50c, carolinensis, Conr. North Carolina 50c, duclosiana, Bart. Transylvania 30c, elongata, Broc. Italy 50c, expansa, Gere. Italy 60c, leporina, Lam France 75c, lyncoides, Brgn. Touraine, Italy 75c, myeri, Bottg. Germany 50c, platypyga, McCoy, Australia $3, spirata, Sohl. Denmark 50c, splendens, Grat. France $1, sanguinolenta, Duj. France 50c, subexcisa, A. Brm. Germany 30c, pyrum, Gmel. Australia 50c, elegans, Defr. France 25c, bullata, Denmark 35c, Trivia avellina, Sby. 40c, T. europea, Sby. 25c, T. affine, Duj. 40c, T. sphaericulata, 50c, T. lamarckii, Desh. 30c.

We also have some unusual specimens not often listed in any catalogue. For instance a extra testudinaria $1.50, beautiful red pantherinas at $2 50, one red Mappa at $1 50, lemon yellow erosa 25c, young caput-serpentis at 10c, orange-colored vitellus at 50c, banded vitellus at 40c, young vitellus at 25c, good size, distorted carneola at 50c, young carneola, over three inches long, at 75c, and we have fully developed specimens of same species at 5 to 10c, about ¾ inches long, young thersites, Bulla form, at 50c, young talpa 25c, young cinerea, bulla form 15c, young helvola 15c, young arabica at 15c, and large young arabica 2½ inches, with scarcely any teeth developed 35c, young reticulata 20c, specimens of arabica, size and shape of scurra, intergrading 50c, young arenosa 20c, young ventriculus at 25c, young mus at 20c, young scottei, but damaged some at 50c, young spadicea, with none of natural color formed, but with lip well developed at 50c, also all forms of this beautiful species up to perfect types, young pyrum with three bands at 30c, young onyx with two bands and bulla form 25c, young lynx, all sizes up to two inches 10 to 20c, young mauritinas, bulla form 25c, larger with lip formed at 30c, and still larger, streaked, showing stage before last coat of enamel is formed 40c. In the Cervus and exanthema group we have every form, size and color imaginable in the species; bulla form 25c.

Send in a list of those you wish to examine at once, assured of prompt reply.

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Albion, N. Y.

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Walter F. Webb, Albion, N. Y.

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Bahama Coral, such as Fan, Head, Palm, etc. Several species at 10c pound.

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Mixed Shells, from Bahamas, nice for fancy work, 25c quart.

Fasciolaria distans, Tulip, 2 inch, 36c dozen.

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Tube Sponges, a great curio from Bahamas, $1.50 dozen.

Scaphites nodosus, an ammonite shaped fossil from the Bad Lands, 1 inch, 30c doz., 2 inch, 50c dozen; 2¼ inch, $1 00 dozen.

Make up your order now, as these prices only hold good while stock lasts.

W. F. WEBB, Mgr., Albion, N. Y.

IMPORTANT NOTICE.

We desire to announce that owing to the many improvements made in the current volume of the **Fern Bulletin**, the price of sample copies will now be fifteen cents each. Purchasers of sample copies may deduct this sum from the regular subscription price when subscribing. The January number contains fourteen articles on ferns, many shorter notes, and eight pages devoted to the Mosses. Send for it. Address,

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